A. P. HOWES
Publisher

M. D. REESER
Advertising Manager

AMERICAN DYESTUFF REPORTER

LOUIS A. OLNEY
Directing Editor

NORMAN A. JOHNSON
Managing Editor

Copyrighted 1936 by Howes Publishing Co.

DEVOTED TO THE INTERESTS OF TEXTILE CHEMISTRY
• BLEACHING • DYEING • FINISHING • PRINTING •
AND THE NECESSARY MECHANICAL EQUIPMENT

"Circulated Everywhere Textiles Are Processed"

Subscription Price: $5.00 per year; Canadian, $6.80; Foreign, $6.00. Fifty cents per copy

VOLUME 25 | DECEMBER 28, 1936 | NUMBER 26

CONTENTS OF THIS ISSUE

Contents of previous issues can be found by consulting the Industrial Arts Index at your library

General

Studies on Determination of Sulfate and Sulfuric Acid on Wool 719
Alban Eavenson and Joseph W. Creely
Non-Hardenable Austenitic Chromium-Nickel Steel Known as "Stainless Steel" 733
Henry Barker Burke
Book Reviews 736
Technical Notes from Foreign Sources 737
Trade Notes: New Products 738

Proceedings of
American Association of Textile Chemists and Colorists

Cloth for Crock Meter P723
Proceedings, Annual Meeting P723
A Study of the Mercerization Process. Part II. The Effect of Tension P724
Sidney M. Edelstein
Microscopy of Rayon Filaments P726
Fred A. Mennerich
One Hundred and Ninth Council Meeting P728
One Hundred and Second Meeting, Research Committee P729
Meeting, Philadelphia Section P723
Meeting, Piedmont Section P729
Meeting, Northern New England Section P730
Unemployment Register P730

Editorial:

More on Getting Along with People—III 731

Official Publication of the American Association of Textile Chemists and Colorists

THE OBJECTS OF THIS ASSOCIATION ARE:

"To promote increase of knowledge of the application of dyes and chemicals in the Textile Industry.

"To encourage in any practicable ways research work on chemical processes and materials of importance to the Textile Industry.

"To establish for the members channels by which the interchange of professional knowledge among them may be increased."

Published Every Other Monday

HOWES PUBLISHING CO. ~ ~ 440 FOURTH AVE. ~ ~ NEW YORK

CLOSING DATE FOR ADVERTISING COPY . . . . . MONDAY PRECEDING ISSUANCE DATE

SULPHUR BLACKS

Better Workmanship and Economy call for •

- **CALCOGENE BLACK 5G**
- **CALCOGENE BLACK 5G Conc.**
- **CALCOGENE BLACK GX Conc.**
- **CALCOGENE BLACK R**

Excellent Money Value

..thru accented solubility and extraordinary working properties.
UNDER THIS TRADEMARK

Calco

FEATURES THAT RECORD *Uniform Superiority*

See for Yourself! Make this test!

• THEY *Are* SOLUBLE IN WATER!

AND NOW! . . this short-cut to convenience *plus* the dependable Quality features of CALCO SULPHUR BLACKS.

THE CALCO CHEMICAL COMPANY • INC.

BOUND BROOK • NEW JERSEY

35 Hartford St., Boston • 90 West St., New York • 401 N. Broad St., Philadelphia
146 W. Kinzie St., Chicago • 1112 S. Blvd., Charlotte • 40 Fountain St., Providence

A DIVISION OF AMERICAN CYANAMID COMPANY

AMERICAN
DYESTUFF REPORTER

VOLUME 25 DECEMBER 28, 1936 NUMBER 26

Studies on Determination of Sulfate and Sulfuric Acid on Wool

ALBAN EAVENSON and JOSEPH W. CREELY

INTRODUCTION

THESE studies were developed in an attempt to work out a quick and reasonably accurate mill control method for the determination of sulfate and sulfuric acid on wool.

There are a number of methods for the determination of free sulfuric acid on wool, the more prominent being:

(A) Triethanolamine method[1].

(B) Terephthalic acid method [1, 5].

(C) Distillation with sodium acetate[1]

(D) Pyridine extraction, and direct titration with alkali, using phenolphthalein indicator[2].

(E) Mease Method (applicable for total sulfate only)[3].

Methods A. B and C require too much time for successful control work. A better understanding of method D than is given by the author[2] together with additional notes of Method E, will, we hope, lead to accuracy and speed in the determination of sulfuric acid on wool.

The author of the pyridine method, states that from wools containing sulfuric acid, a 98 per cent recovery can be obtained by soaking the wool for a short time in a 0.5 per cent pyridine solution, and direct titration of an aliquot with standardized sodium hydroxide, using phenolphthalein as the indicator. The pH of pyridine being lower than the pH range of phenolphthalein, the presence of excess pyridine does not interfere with the titration. If Barritt[2] is right, no better mill control method is desirable, for with 98 per cent recovery there is little need to supplement the pyridine extractions by proceeding with method E for the small remainder. The method appears so promising as to ask for investigation.

WEIGHT OF SAMPLE

A definite weight of sample is necessary in any type of accurate analytical work on wool. We did a great deal of work with the constant humidity atmosphere afforded by saturated ammonium chloride solution. Samples of about 0.8 gms. were placed in the low wide form of weighing bottles. and these in a large dessicator over saturated ammonium chloride solution, weighed daily, for 24 days; the lowest temperature being 19° C. and the highest temperature 23° C. The weighings of the first three days were disregarded, the subsequent daily weighings varied from .003 gms. to as much as .005 gms. These variations were too great for even moderate accuracy.

Drying in an oven to a constant weight, using this same form of weighing bottle, did not give satisfactory results, as we could not obtain bottles with joints sufficiently tight to prevent a very considerable gain when weighing.

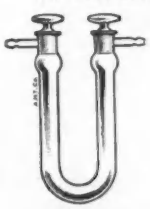


Fig. 1

We obtained very satisfactory results by the use of a 150 mm. U tube, as shown in Fig. 1. There was available a very good constant temperature oven. An opening to fit the U tube was cut in the top of this oven, and the space between the limbs of the U tube was closed with a well-fitting piece of transite board. With this arrangement, the side outlet and the rubber connections were outside the oven. From 1 to 1.5 gms. of wool were placed in the U tube and a current of thoroughly dried air slowly aspirated through the tube; the oven being maintained at a temperature of 105° C. (± 1° C). Drying for a period of two hours was amply sufficient, and we were able to get a dry weight of wool, which on further drying usually checked within .0003 gms. and seldom as much as .0005 gms. Accurate weighings are aided by using another U tube as a tare.

This exactness is not obtainable with yarns containing much oil or grease, as under these conditions, there is a slight volatilization of grease or oil, which, at times, is visible near the side outlet on the exit side of the U tube.

When a series of determinations is to be made, it is well to spread the wool loosely and allow to remain over night, and then to weigh out quickly a sufficient number of samples of the desired amount, placing these samples in bottles marked with the weight and then making a moisture determination on one of the samples. It is immaterial what changes of weight subsequently occur, as we have

on each bottle the weight of sample and moisture content at time of weighing.

STUDY OF PYRIDINE TITRATIONS

Percentages recovery of acid from wool yarn which had been treated with 7.45 per cent sulfuric acid and dried overnight at room temperature were lower than those obtained by Barritt. We obtained 93.0 per cent, 92.8 per cent, and 92.4 per cent recovery. In comparison with the recoveries (up to 98 per cent) obtained by Barritt[2], this is quite a difference. In Barritt's article, no mention is made of drying the acid on the test material. This may account for the difference in result. To study the effect of drying the acid on the wool, the following determinations were made. Three samples (2.5 gms. each) of purified yarn were wet out in warm water, squeezed, and the squeezed samples placed in flasks and treated with 5, 10 and 15 mls. of 0.1N sulfuric acid, and dried in a current of air at about 20° C. for three days, the yarn then being quite dry. Without removing the yarn from the flasks, the samples were digested for 1 hour at 55° C. with 150 mls. of 0.5 per cent pyridine solution. An aliquot was taken and titrated with 0.1N NaOH using phenolphthalein as indicator. The results are shown in Table 1.

TABLE 1

No.	*Acid Used*	*% H_2SO_4 on yarn*	*% Recovery*
1	5 mls. 0.1N H_2SO_4	0.98	79.5
2	10 mls. 0.1N H_2SO_4	1.96	85.5
3	15 mls. 0.1N H_2SO_4	2.94	88.0

Evidently, drying, even at ordinary temperatures, promotes combination of sulfuric acid with wool, and this combination affects the percentage of recovery by pyridine titration.

Wool and noils are thoroughly dried in carbonization, and to study further the effect of drying on the results obtained by pyridine extractions, the following determinations were made on lots of wool and noils, carbonized by the sulfuric acid process with several modifications of the carbonizing process and consequently with varying amounts of acid. These samples were carded and mixed thoroughly three times.

Sample 1

Fine noils, carbonized and dusted, no acid having been removed after carbonizing.

Sample 2

Fine noils, carbonized, dusted and rinsed with part of the acid removed with cold water.

Sample 3

Australian lambs wool, carbonized, dusted and neutralized, the acid having been removed with warm water and sodium carbonate.

Sample 4

Australian lambs wool, carbonized and dusted, no acid having been removed after carbonizing.

Sample 5

Australian lambs wool, carbonized, dusted and rinsed, with part of the acid removed with cold water.

Sample 6

Australian lambs wool, carbonized, dusted and neutralized, the acid having been removed with warm water and sodium carbonate.

These were given successive extractions as follows: about 2.5 gms. of the above samples were digested one hour at 55° C. using 150 mls. of 0.5 per cent pyridine solution, filtered through a Buckner funnel, suction applied, then given two washes, each with 100 mls. boiled distilled water; suction applied, then titrated against 0.1N sodium hydroxide using phenolphthalein indicator. The second, third, fourth and fifth digestions were made in the same manner, except that they were made at room temperature, and for the times shown in Table 2.

A wide variation of acid content is presented here, and it is interesting that regardless of the amount of acid on the stock and the amount obtained on the first extraction, the sum of the percentages of acid obtained in the succeeding digestions, plus the acid obtained gravimetrically by the Mease method (in the stock after extraction) is rather constant. These sums are 0.57, 0.70, 0.76, 0.89, 0.77, 0.64. An average of 0.72 per cent.

TABLE 2

Percentage of Sulfuric Acid on Wool (Dry Basis)

Treatment	*Sample* (1)	*Sample* (2)	*Sample* (3)	*Sample* (4)	*Sample* (5)	*Sample* (6)
1st Extraction 1 hour	6.01	2.35	0.34	6.70	3.11	0.39
2nd Extraction 30 min's.	0.05	0.12	0.04	0.20	0.08	0.05
3rd Extraction 30 min's.	0.08	0.06	0.03	0.09	0.06	0.04
4th Extraction 30 min's.	0.10	0.04	0.03	0.08	0.05	0.03
5th Extraction about 20 hrs.	not made	not made	0.06	0.08	0.11	0.05
Mease on wool after above extractions*	0.34	0.48	0.60	0.44	0.47	0.47

*The Mease method was modified as will appear later.

If we take the percentage of sulfuric acid obtained in the first pyridine extraction, and add this average of 0.72 per cent, the results figure as shown in Table 3.

TABLE 3

H_2SO_4 from 1st Extraction	Average to be added	Sum of These two	Total H_2S_4O Found	Difference
6.01	0.72	6.73	6.58	+0.15
2.35	0.72	3.07	3.05	+0.02
0.34	0.72	1.06	1.10	—0.04
6.70	0.72	7.42	7.59	—0.17
3.11	0.72	3.83	3.88	—0.05
0.39	0.72	1.11	1.03	+0.08

In Table 2, the third and fourth titrations are so close as to suggest a constant error in the method. Acid continues to come off at the fifth titration, so it was determined to start a fresh series of extractions with both water and pyridine, for the purpose of checking the method and ascertaining, if possible, the number of extractions necessary to reach an end point. Sample 5, being of average acid content, was selected.

A straight calcium chloride tube containing glass wool in the bulb, was washed several times with boiling water. Sample 5 was then introduced, weighing 2.506 gms. with a moisture content of 8.71 per cent. Boiled distilled water was allowed to drip slowly on the wool at the rate of about 200 mls. per hour. When a volume of about 350 mls. had passed through the wool, titration was made with 0.1N sodium hydroxide using phenolphthalein as indicator. Forty-two of these extractions were made before the titration corrected for blank was zero.

Concentration of the wash water to a very small bulk and precipitation with barium chloride after correcting for the barium sulfate blank on the volume of water used, showed that sulfuric acid was still being removed from the fiber. The wool, after the preceding forty-two water extractions, was extracted five times with 0.5 per cent pyridine, following the procedure previously outlined. The remaining sulfuric acid on the wool, after all the above extractions, was determined by the Mease method, modified as will appear later. The result was 0.57 per cent sulfuric acid.

The previous result on this same wool was 0.47 per cent acid on the gravimetric determination. This is not a close check, but the wool (after the forty-two water extractions, and the manipulation necessary for thorough wetting out) was felted, and the pyridine solution did not penetrate as well as in the original sample which was more open.

Long continued pyridine extractions were also studied. Another 2.5 gm. sample (5) was allowed to soak for twenty-four hours at room temperature in 0.5 per cent pyridine solution. The wool was then filtered, washed and titrated as previously described. This operation was repeated daily for twenty-four days, except week-ends and holidays. The chart of the results follows (Fig. 2.). The peaks on the chart coincide with digestion periods

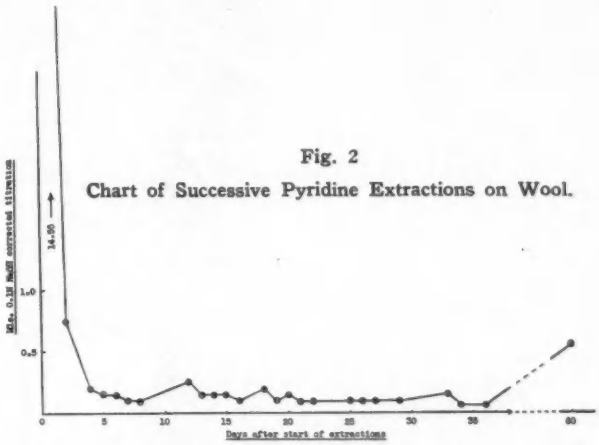


Fig. 2

Chart of Successive Pyridine Extractions on Wool.

longer than 1 day. After the twenty-four titrations, the wool was allowed to stand twenty-four days and a sharp rise of acid occurred. All these digestions were stored in the dark. The result disposes of the thought that there may be a constant error in the method.

If sulfuric acid is baked on the wool fiber, equilibrium could not be reached within the time limits of these experiments in the system, wool-sulfuric acid-water or wool-sulfuric acid-0.5 per cent pyridine solution. This does not invalidate the results shown in Tables 2 and 3, for obviously the greater number of pyridine extractions, and the greater amount of acid removed by these extractions reflects in a lowering of the amount of acid which will be removed gravimetrically after hydrolysis.

A practical mill method for the determination of sulfuric acid on wool is suggested as follows: use approximately 5 gms. of wool, place in a 500 ml. flask, add 300 mls. of 0.5 per cent pyridine solution as near the boiling point as possible. Shake for 5 minutes, take off an aliquot of 150 mls. and titrate with 0.051 normal sodium hydroxide using phenolphthalein as indicator. A solution of this normality avoids calculation as each ml. corresponds to 0.1 per cent sulfuric acid. Shaking is conveniently done with a shaking machine. A corresponding result can be reached by allowing a period of one hour of digestion at room temperature.

If, in mill practice, it becomes necessary to calculate the amount of alkali for complete neutralization, the figure 0.72 per cent (see Table 3) need be given little consideration. The greater part of the acid represented by 0.72 per cent is so firmly held that it is removable so slowly as to have very little effect in the short time necessary for mill operations such as neutralizing, dyeing, fulling, etc.

GRAVIMETRIC SULFATE DETERMINATIONS

In order to check the possible constant error in the results from pyridine extraction, some work was done on the Mease method, without neutralization of the hydrochloric acid used for hydrolysis, using the samples after pyridine extraction. The results were low as was checked by determinations on purified wool to which small known amounts of sulfuric acid was added.

The effect of volume of liquid in which precipitation was made, excess barium chloride and the effect of the presence of large amounts of hydrochloric acid and ammonium chloride, and the reverse method of Popoff and Newman[4] were studied. All results were corrected for blanks.

The method of Popoff and Newman calls for the slow addition of the sulfate-containing liquid to the boiling barium chloride solution. When using this method it is necessary to use very dilute solutions of barium chloride in order to have a volume to permit convenient boiling. This increases the volume of filtrate. The method also causes a transfer from one beaker to another with further increase of volume from the rinsings, and we could not see that this reverse method of working added to the accuracy of the determinations, so the method was discontinued.

In all our studies, we used either 100 mls. or 10 mls. of 0.01N sulfuric acid.

EFFECT OF VOLUME

We obtained the most accurate results with the 100 mls. of 0.01N sulfuric acid, when the final volume of filtrate and washings was kept down to about 250 mls., and with 10 mls. 0.01N sulfuric acid, when the final volume of filtrate and washings was kept down to about 100 mls. In all these determinations, we used 7 cm. C.S. & S. 589 Blue Ribbon filter paper.

EXCESS BARIUM CHLORIDE

It is usually considered necessary to add an amount of barium chloride at least three times the equivalent amount. We find that accuracy is promoted in the determination of small amounts of sulfate, particularly when much hydrochloric acid is present, if a very much larger excess of barium chloride is used. In the system, water, barium sulfate, barium chloride and hydrochloric acid, the presence of a large excess of barium chloride materially reduces the solubility of barium sulfate. When the amount of sulfate present was equivalent to 0.0117 gms. barium sulfate, we obtained the most accurate results when sufficient barium chloride was added to give a normality of about 0.0625.

EXCESS HYDROCHLORIC ACID

Three portions of 100 mls. 0.01N sulfuric acid were treated as follows:

To (1) was added 1 drop 30 per cent hydrochloric acid,

To (2) 1 ml. 30 per cent hydrochloric acid,

To (3) 20 mls. 30 per cent hydrochloric acid, this being the amount used in the Mease method for hydrolysis of 1.0 gm. wool.

These were precipitated, using an amount of barium chloride solution equal to 0.5 gm. Ba $Cl_2.2H_2O$ in a bulk of 150 mls., digested five hours at 88° C. and then overnight at room temperature. The clear liquid was decanted through the filter, this main filtrate set aside and the precipitate transferred to a filter, washed and these washings set aside. The main filtrates from (2) and (3) were neutralized, one ml. of hydrochloric acid in excess added, and allowed to stand twenty-four hours. It was not necessary to neutralize the washings so 1 ml. 0.5N barium chloride was added and the solution was allowed to stand twenty-four hours. Then the solution was warmed, filtered and the filter paper ignited. Results are shown in Table 4.

TABLE 4

	$BaSO_4$ from main filtrate	*$BaSO_4$ from washings*	*$BaSO_4$ in slightly acid main filtrate*	*Total $BaSO_4$ Found*	*Equivalent of $BaSO_4$ Present*
1	0.1163	0.0010	0.0001	0.1174	0.1170
2	0.1166	0.0004	0.0003	0.1173	0.1170
3	0.1096*	0.0006	0.0084	0.1186	0.1170

*Barium sulfate not perfectly white, but on second ignition, there was no loss of weight.

The preceding results show that in the presence of a large excess of hydrochloric acid and very little sulfate, the precipitation of barium sulfate is incomplete. This is in agreement with results in the literature. Mease[3] obtained very good results in the presence of 20 mls. excess of 30 per cent hydrochloric acid, but he was working with a relatively large amount of sulfate, sufficient to yield about 0.2 gm. barium sulfate.

The ammonium chloride resulting from neutralizing did not appreciably affect the accuracy of the results.

SUGGESTED MODIFICATIONS OF THE MEASE METHOD[3]

In this method, 1 to 1.5 gms. of wool is hydrolyzed, using 20 mls. 30 per cent hydrochloric acid (by weight) in a large test tube, in a water bath at 95-100° C. The solution is cooled, diluted with an equal volume of water, filtered, diluted to 250 mls., then precipitated using 10 mls. 5 per cent barium chloride solution.

It is suggested:

(1) That the test tube be removed from the water bath just as soon as every trace of fiber has disappeared. In all cases flocculent insoluble matter (humin) appears, the amount of which is apt to increase by unnecessary prolongment of the time of hydrolysis.

(2) That the hydrochloric acid used for hydrolysis be neutralized with ammonium hydroxide, and 1 ml. 20 per cent hydrochloric acid added.

(3) That the bulk of solution be kept small, the time of digestion at least 12 hours, and the barium chloride used for precipitation in large excess.

ACTION OF WOOL TOWARD SODIUM SULFATE AND SODIUM ACID SULFATE

For this study we used a yarn specially prepared for the work of Dr. Milton Harris at National Bureau of Standards. The wool from which this yarn was made was solvent scoured, and had never been subjected to the action of alkalies. It was further purified by extraction

(Continued on page 732)

PROCEEDINGS OF THE
American Association of Textile Chemists and Colorists

DECEMBER 28, 1936

Officers of the Association

WILLIAM H. CADY, *President*
U. S. Finishing Co., Providence, R. I.

ALBAN EAVENSON—ELMER C. BERTOLET, *Vice-Presidents*

WILLIAM R. MOORHOUSE, *Treasurer*
National Aniline & Chemical Co., Boston, Mass.

HAROLD C. CHAPIN, *Secretary*
Lowell Textile Institute, Lowell, Mass.

LOUIS A. OLNEY
President Emeritus and Chairman of the Research Committee
Lowell Textile Institute, Lowell, Mass.

Councilors-at-Large

BERKELEY L. HATHORNE
G. R. KREMERS
CARL Z. DRAVES
HAROLD M. CHASE
ARTHUR E. HIRST
HENRY F. HERRMANN

Councilors Representing Sections

BEN VERITY (Rhode Island)
HANS MEYER (New York)
ROLAND E. DERBY (N. New England)
C. A. JONES (South Eastern)
R. M. RITTER (Philadelphia)
ELMER F. SMITH (Midwest)
R. S. WHEELER (South Central)
CHESTER L. EDDY (Piedmont)

Local Sections and Their Officers

Northern New England Section
Carl Z. Draves, Chairman, Ludlow Mfg. & Sales Co., Ludlow, Mass.
John N. Dalton, Secretary, Pacific Mills, Worsted Division, Lawrence, Mass.

Rhode Island Section
John G. Masson, Chairman, Rosemont Mill, Woonsocket, R. I.
Raymond A. Pingree, Secretary, 7 Sayles Ave., Saylesville, R. I.

New York Section
George L. Baxter, Chairman, Bradford Dyeing Association, 40 Worth St., New York, N. Y.
P. J. Kennedy, Secretary, E. I. duPont de Nemours & Co., Inc. 61 Thomas St., New York, N. Y.

Philadelphia Section
Herbert S. Travis, Chairman, Rohm & Haas Co., Inc., 222 West Washington Square, Philadelphia, Pa.
R. W. Delaney, Secretary, National Aniline & Chemical Co., 200 S. Front St. Philadelphia, Pa.

Piedmont Section
Thomas R. Smith, Wiscasset Mills Co., Albemarle, N. C.
A. Henry Gaede, Laurel Soap Mfg. Co., Charlotte, N. C.

South Central Section
Walter E. Hadley, Chairman, Standard Coosa Thatcher Co., Chattanooga, Tenn.
Murray B. Smith, Secretary, 2404 Union Ave., Chattanooga, Tenn.

Midwest Section
Arthur T. Brainerd, Chairman, Ciba Co., 325 W. Huron St., Chicago, Ill.
Elias A. Johnson, Secretary, National Aniline & Chemical Co., 357 W. Erie St., Chicago, Ill.

South-Eastern Section
C. A. Jones, Chairman, Georgia School of Technology, Atlanta, Ga.
Robert H. Harris, Secretary, Spalding Knitting Mills, Griffin, Ga.

Lowell Textile Institute Student Section
Lee Gale Johnson, Chairman; Hugh Francis Carroll, Secretary.

North Carolina State College Student Section
A. E. Shumate, Chairman; J. W. Furr, Secretary

Members should notify the **Secretary** immediately of all address changes

CLOTH FOR CROCK METER

Squares of bleached white cotton cloth of the exact size and specification recommended in the 1935-36 Year Book for use with the Crock Meter are ready for distribution at the following prices:

Packages of 100	$ .20 postpaid
3 packages	.50 postpaid
7 packages	1.00 postpaid

(Smaller amounts may be paid for in United States postage stamps). They may be obtained from L. A. Olney, Lowell Textile Institute, Lowell, Massachusetts.

PROCEEDINGS, ANNUAL MEETING

WE have been asked why there is so much delay in publishing the Proceedings of the Annual Meeting.

For many years we have sent to many of those taking part in the meeting not only printer's proof of their paper, but also of any discussion which followed, in order that any necessary corrections might be made. This naturally delays their final publication but has been found to be much more satisfactory to all concerned.

MEETING, PHILADELPHIA SECTION

THE second of the 1936-1937 season meetings of the Philadelphia Section was held on Friday, November Twentieth, at the Penn A. C. in Philadelphia.

After the usual informal dinner and routine business, during which the Chairman, who presided, directed attention to the annual convention and means and costs of transportation to Providence, Dr. Charles S. Venable, of the Viscose Co. presented an illustrated talk on the subject: "The Latest Developments in Rayon."

Dr. Venable presented his address in an interesting and instructive manner as indicated by the discussion that followed and the sincerity of the rising vote of thanks which he received. Attendance 63.

Respectfully submitted by

CHARLES A. SEIBERT,
acting for the secretary.

A Study of the Mercerization Process

Part II. The Effect of Tension

SIDNEY M. EDELSTEIN*

INTRODUCTION AND SUMMARY

IN a previous paper[1], the effect of the mercerizing caustic concentration on the properties of 40/2 cotton yarn of balanced twist held at a constant position during the treatment with the mercerizing caustic solution was studied. In that work, it was found that the higher the concentration of the mercerizing caustic solution, the greater was the tension necessary to hold the yarn at the constant position and the higher was the luster of the finished yarn.

The effect of tension during mercerization has been discussed by several workers from the viewpoint of the final luster and strength of the mercerized cotton[2, 3, 4, 5, 6, 7] but their results are not in good agreement.

In the present investigation, the effect of tensions greater than that necessary to prevent the yarn from shrinking during the caustic treatment has been studied.

Skeins of combed 40/2 cotton yarn of balanced twist were mercerized under three different tensions in 25, 30, 35, 50 and 60 degrees Tw. caustic solutions. The skeins were washed, neutralized, dried and wound upon cones. Tests were made on the finished samples for luster, tensile strength, elongation and barium absorption. Fabrics were also knitted from the samples and dyed.

The results of these tests may be summarized as follows:

(1) The application of the same tension to yarn mercerized in caustic solutions stronger 30 degrees Tw. resulted in the luster of the finished samples being very closely the same.

(2) In those samples mercerized in the weaker caustic solutions, there was a tendency towards unevenness as shown by the dyed fabrics.

(3) The greater the tension applied to the yarn in a particular caustic solution, the greater was the luster and the less was the direct dye affinity of the finished material.

(4) Applications of tensions ranging from that necessary to prevent the yarn from shrinking in the caustic solution to the maximum tension that could be applied to the yarn showed no noticeable effect on the tensile strength or barium activity number of the finished yarn.

(5) The elongation properties of the mercerized yarn were decreased by the higher tensions.

(6) The application of a particular tension to the yarn in the caustic caused the greatest amount of stretch in the weakest caustic solution.

Note: One must bear in mind that there is a distinction between the tension applied to yarn or cloth during the caustic treatment and the stretch or contraction that the yarn or cloth undergoes in the caustic solution. The tension is a more fundamental factor whereas the stretch or contraction of the yarn or cloth under a particular tension depends on several factors.

PREPARATION OF MERCERIZED SAMPLES

30 gram skeins of 40/2, combed 1⅛ inch Miss. Delta cotton yarn of balanced twist were used in the preparation of the mercerized samples. After being wet out in a 1% sulphonated castor oil solution, the skeins were mercerized under different tensions in 25, 30, 35, 50 and 60 degrees Tw. caustic solutions at 85 degrees F. on an experimental mercerizing machine. After treatment with the caustic solution, each skein was washed while held in position on the machine and then removed, neutralized in 1% sulfuric acid, washed, neutralized in dilute ammonia, washed and dried at 165 degrees F. The mercerizing machine and the method of preparation of the samples were the same as described in a previous paper[1] with the exception that different tensions were used during the caustic treatment.

The tensions used in the preparation of the samples were:

(A) The maximum tension that could be applied to the yarn without causing any breakage of the yarn in the caustic solution.

(B) A tension of 135 lbs. on each 30 gm. skein.

(C) Enough tension to prevent the yarn from shrinking in the caustic.

(A) was determined approximately in each solution by increasing the tension on a skein in the solution until several threads broke. A tension 5% less was then adopted for this particular solution. Tensions (A) and (B) were applied only after the skein had been thoroughly saturated with the caustic solution while held at its original length. Before washing the skeins, they were locked at their stretched positions in the caustic solution.

The amount of stretch that the skeins underwent in each of the caustic solutions under the various tensions

*Research Associate, A.A.T.C.C., working at the University of Chattanooga.

is given in Table I. Tensions are given for a 30 gm. skein.

The finished samples were examined for tensile strength, elongation, luster, dye affinity and barium activity numbers.

TABLE I

Caustic conc.	*Maximum tension (A)*	*% Stretch under A*	*% Stretch under B (135 lbs.)*	*Force to prevent yarn from shrinking (C)*
25° Tw.	375 lbs.	6.5%	3.72%	45 lbs.
30	495	5.5	2.0	68
35	510	5.3	1.8	75
50	450	4.65	0.9	98
60	450	4.2	0.5	112

EXPERIMENTAL RESULTS

(1) Tensile strength and elongation.

In Table II are given the results of tensile strength and elongation tests made on the mercerized samples. The tests were made on 120 yd. skeins under standard conditions of temperature and humidity and each figure in the table is the average of three determinations.

The results show that the tensile strength of the mercerized samples was not noticeably affected by the amount of tension during the mercerization (tensions greater than that required to prevent shrinkage). The elongation of the yarn at the break was considerably reduced by the higher tensions, however. This was further shown by the fact that fabrics knitted from these samples were noticeably less elastic than the fabrics knitted from the samples prepared under low tension.

TABLE II

Tensile strength and elongation

Sample caustic conc.	*tension*	*Break*	*Elongation at Break*
25° TW.	A series	156 lbs.	3.8%
30		181	3.5
35		168	3.5
50		162	3.8
60		172	3.8
25	B series	157	5.0
30		163	4.2
35		154	4.1
50		165	4.2
60		163	4.6
25	C series	158	5.2
30		162	4.5
35		165	4.7
50		168	4.5
60		181	5.2
Unmercerized		125	5.2

(2) Luster

The luster of the finished samples in the form of small skeins were compared visually by several persons experienced in grading luster. The luster of these skeins were also compared after dyeing with 1% Sky Blue FF. The comparisons of the different graders were in close agreement and were the same after dyeing the samples. The results of these gradings showed that the samples mercerized in caustic solutions stronger than 30 degrees Tw. under the same tension had closely the same luster.

Samples mercerized in the caustic solutions weaker than 30 degrees Tw. showed only a small amount of luster. The gradings also showed that for any particular caustic solution the greater the tension put on the yarn, the greater was the luster of the finished yarn.

(3) Dyeing Properties

Plain fabrics were knitted from the mercerized samples and were dyed with 1% direct Brown BT. This particular dyestuff was selected because of its ability to show plainly differences in dye affinity of mercerized cotton. The dyeings were made as follows:

The fabrics were wet out at 140 degrees F. in 1% sulphonated castor oil solution and then entered into a 30 to 1 dye bath at 140 degrees F. The dye was added and the bath raised to the boil. 20% salt was then added and the dyeing at the boil continued for some time. The fabrics were washed and dried.

Examination of the dyed fabrics showed that for each mercerizing solution used, the greater the tension applied to the yarn, the less was the resultant dye affinity. Also for a particular tension used, the samples mercerized in the 30 degrees and 35 degrees Tw. solutions showed only slightly less dye affinity than those samples mercerized in the 50 degrees and 60 degrees Tw. solutions. It was noted however that the samples mercerized in these weaker solutions gave uneven dyeings, particularly when mercerized under the higher tensions. The matter of unevenness is being studied further.

(4) Barium activity numbers.

The barium activity numbers[8] of the samples were determined and were found to be unaffected by the amount of tension on the yarn during the mercerization.

TABLE III

Barium activity numbers.

Caustic conc.	*Tension A*	*Tension B*	*Tension C*
25° Tw.	118	123	123
30	156	150	153
35	163	163	163
50	163	166	166
60	166	166	166

DISCUSSION

High luster, increased tensile strength and high dye affinity are the desired qualities in mercerized cotton. Along with these qualities others such as evenness of dyeing and elasticity are also necessary.

In examining the above results, it is seen that these desired properties are not influenced by a particular factor in the same manner. The greatest luster is produced by the maximum tension but this high tension reduces the dye affinity and elasticity of the material.

In so far as the above experiments were concerned, it was not possible to obtain mercerized cotton having the

maximum luster, dye affinity and elasticity at the same time. This indicates that a compromise between the desired properties must be adopted but further study may show means of increasing these desired properties.

In commercial mercerization, caustic soda solutions are usually used which range from 50 to 60 degrees Tw. These commercial solutions usually contain several per cent of impurities such as sodium carbonate and pectic matter removed from the cotton. Even assuming that these impurities have no effect on the mercerizing properties of the solution, the Tw. of the solution equivalent to the caustic soda alone would be several degrees lower than that actually measured*. The above results indicated that just as good luster could be obtained in a 35 degrees Tw. caustic solution as in a 50 degrees Tw. solution by the application of the same tension. These results however were obtained in pure caustic solutions containing less than 0.2% sodium carbonate. Furthermore, the weaker mercerizing solutions were more critical as evidenced by the unevenness of the dyed fabrics made from the yarn mercerized in these weaker solutions. It consequently appears that a commercial caustic solution near 50 degrees Tw. should be uncritical and should give more satisfactory results than a solution of 35 degrees Tw.

*The effect of impurities on the mercerizing properties of caustic solutions is being investigated.

REFERENCES

[1] Am. Dyestuff Reptr., *25*, P458-66 (1936).
[2] E. R. Clark. Textile World, *56*, 43-9 (1919).
[3] H. Lowe. J. Soc. Dyers Colourists, *37*, 296-8 (1921).
[4] Skinkle and Lindsly, Am. Dyestuff Reptr., *18*, 515-7 (1929).
[5] Skinkle and Hale. Am. Dyestuff Reptr., *20*, 547-56 (1931).
[6] O. Mecheels. Melliand Textilber, *13*, 645-9 (1932).
[7] S. M. Neale. J. Soc. Chem. Ind., *50*, 177-82T (1931).
[8] S. M. Edelstein. Am Dyestuff Reptr., *25*, 186 (1936).

Microscopy of Rayon Filaments*

FRED A. MENNERICH†

TO determine the physical structure and variation in shape and size of rayon filaments, an instrument, which is capable of seeing the small differences, must be used. Present day rayon filaments are remarkably microscopic in size—they are from 10 to 30 microns in diameter. This means that the individual serrations on a fine filament of viscose are on the order of magnitude of one micron, which is equivalent to approximately 0.00004 of an inch. Such minute structure is entirely invisible to the unaided human eye and must, therefore, be resolved by the magnifying eye of a compound microscope.

Variations in the viscosity of the spinning bath, chemical composition of the coagulation bath, rate of drying and other factors leave their trade marks and foot prints either inside or on the surface of the rayon filaments as they go through the steps of various chemical and physical processes.

To make visible these tiny footprints, nothing is more appropriate than the proper optical arrangement of apochromatic objective, compensating eyepiece, achromatic condenser and the finest of research microscope illuminators, so that the microscopic is made macroscopic at a magnification of 100 to 1000 diameters. The best equipment loses its power of resolution unless an experienced microscopist, who has the technique that is required, skillfully mounts the filaments either longitudinally or in a cross-section in a satisfactory mounting medium and then proceeds to carefully examine and measure the small strands of altered cellulose as extruded through platinum spinnerets.

Generalized statements, such as the preceding, tell us nothing about the technique to use or what to look for and measure; therefore, let us proceed to unveil the mysteries of the microscopic structure of rayon filaments.

For longitudinal examination the filaments are mounted in glycerine or Canada balsam between a glass slide and a cover slip. To reveal both shape and size of filaments, a cross-section mount is necessary. This can be made by pulling a bundle of filaments into a small hole in a thin metal plate and then cutting off the projecting ends with a razor blade[1]. For delustered or dyed samples, the microscopist must resort to very thin cross-sections, which are held in transparent celluloid[2].

Identification of the type of rayon can be made from longitudinal mounts if the yarn is undyed. The staining with neo carmine W is a great aid, because the various rayons become dyed as follows:

Viscose.....wine red
Acetate.....lime
Cuprammonium.....deep blue
Nitro-cellulose.....reddish violet

as a further aid:

Diphenylamine solution* dyes nitro-cellulose, blue.
Acetone dissolves acetate.

On dyed or delustered yarns the identification must be made from thin cross-sections, which reveal the characteristic shape of the filaments[3] as follows:

Viscose.....serrated edge.
Acetate.....clover leaf shaped.
Cuprammonium.....uniformly circular.

*Presented at meeting, New York Section, Oct. 23, 1936.
†U. S. Testing Co.

*Mix 66 grams conc. H_2SO_4 with 33 grams. conc. CH_3COOH, then add I gram diphenylamine.

Nitro-cellulose.....similar to acetate, but has more 4 leafed filaments.

When a yarn is composed of several rayons or mixed with other fibers, the composition can be obtained by counting and classifying a sufficient number of them; however, their average diameters and variation in density must be taken into consideration. The percentage by weight varies directly as their density and as the square of the mean diameters.

Horizontal projection at 500 diameters magnification onto a co-ordinately ruled ground glass screen, which is in a vertical position, greatly facilitates the rapid counting and classification of the various component fibers[4]. Measurements of both minor and major diameters with one setting of a "Bi-Diameter Scale" are readily made at the rate of 100 fibers in five minutes[4].

Very often dark or light streaks and bands appear in finished rayon fabrics and sometimes yarns fail to crepe properly. These defects are generally solved by assuming that mixed lots of rayon were used. That one of the lots has varied from normal can often be revealed by careful microscopic examination and measurements of the individual filaments, such as the following:

(1) Composition of the yarn.
(2) Number of filaments.
(3) Filament size and the distribution or frequency of the various sizes.
(4) Filament shape as measured by the ratio of the minor diameter to the major diameter.
(5) Number of serrations and their magnitude.
(6) Fullness of the cross-sections as measured by the ratio of their circumferences to the circumference of a circle of equal area. The former is measured by a chartometer and the latter by a planimeter.
(7) Density of the filaments as obtained by the relationship between the denier, number of filaments and cross-sectional area[5].
(8) Swelling of the filaments in water as measured by the percentage increase in diameter of the filaments, after they have been exposed to the swelling action of water for a sufficient period of time.
(9) Degree of delustering by counting the number of pigment particles per unit area.

Other variations in microscopic structure may be revealed by careful technique and manipulation of a petrographical microscope, which is equipped with suitable polarizers, quartz wedges, and selenite plates. This more comprehensive "eye" shows the polarization colors and their order, measures their angle of extinction, and indicates the bi-refringence which is the difference between the two indices of refraction that all rayons have due to their anisotropic properties.

The above outline of the microscopical examination of rayon filaments is rather brief; however, it does show the importance and versatility of the modern microscope for identifying the type of rayon and also in measuring the numerous "foot prints" left in or on the filaments due to the effect of variation in manufacture.

REFERENCES

[1] E. R. Schwarz—"Textiles and the Microscope." McGraw-Hill Book Co., New York, N. Y., (1934), p. 124.
[2] J. I. Hardy—"New Cross-Sectioning Device." Textile Research V, 12, 1935, p. 580.
[3] Rayon Handbook. Rayon Publishing Corp., New York, (1936), p. 438.
[4] Fred A. Mennerich—"Rapid Microscopical Measurement of Diameters in Cross-Section." Textile Research VI, 4, 1936, p. 217.
[5] E. R. Schwarz—"Density Determination of Textile Fibers." Melliand, I, 12, 1930, p. 1823.

DISCUSSION

Mr. Mennerich: I have this little Hardy sectioning device here and also the scale, and a reprint which gives the method of projecting and measuring the cross-sections. You can look over the reprint, and if anyone is interested and would like a copy, if you will drop me a line I will be glad to send you a copy.

Chairman Baxter: I am sure we have all enjoyed listening to Mr. Mennerich's address and seeing the slides which he has presented. I feel sure there are a number of questions you would like to ask. The meeting is open, gentlemen. If you have any questions that you care to ask about this microscopic work, please do so.

Mr. Freedman: By way of opening the discussion, I would like to say that the work Mr. Mennerich is engaged in is a highly interesting one and one that is of considerable importance to all engaged in the textile industry.

The identification of textile fibers is of great interest to everyone: to the manufacturer because of the competitive angle, to the retailer for the same reason, and to the consumer because of the value attached to the fabrics made of different textile fibers and also because of the method of handling these fabrics.

The problem of the textile microscopist is far from being a simple one. One of the greatest problems that confronts the microscopist today is, I should judge, that of determining quantitatively the amount of the various animal fibers in a fabric. For example, I should judge that Mr. Mennerich might be called upon at any moment to find out just as quickly as possible how much camel's hair, mohair, alpaca, and cashmere wool are contained in a specimen, and that is quite a job.

There recently was prepared a commercial standard for wool and part-wool fabrics, and it was supposed to go into effect on October 15, 1936. Whether it did or not I don't know; I haven't received the last word on it. But this particular commercial standard provides for

the labeling at the present time, or rather, the stating of the wool content of fabrics by manufacturers providing the term "wool" is used, and included in the term "wool" are all the other animal fibers. So you can readily see what a big job that is for the textile microscopist. That standard won't go into effect until one year after it has been accepted by the manufacturers. It won't affect the retailers. I don't know whether I made myself clear. The standard won't become effective or operative as far as retailers are concerned until one year after it has become operative for manufacturers.

I am told that the Associated Wool Industries, originally in favor of this commercial standard, are now opposed to it because no definitions were set up for terms like "virgin wool" and "reworked wool." There again that is another job for the textile microscopist, the identification of reworked wool in the presence of virgin wool, and then the determination, if possible, of the amount present. I don't know that anyone has worked it out. If Mr. Mennerich has I would be very happy to hear from him.

Mr. Mennerich: I have worked on it, but I have not worked it out.

Chairman Baxter: Are there any other questions?

Mr. Mennerich: In regard to the analysis of mixed wool fibers, I may add a few words on that. A microscopist who has had sufficient experience, of course, can pick out wool from all the other animal fibers. He generally can quite definitely pick out mohair. He can also pick out camel's hair. But he has a tough time if he has a very fine grade of wool mixed with cashmere and vicuna, and he has an impossible time if alpaca and llama are worked together.

A coat was sent in to be analyzed, and on this coat was a label "one hundred per cent genuine camel's hair." It looked like it from the outside, and the price probably corresponded with it, but under the microscope, having counted a thousand fibers and having taken the necessary measurements, and taking into consideration that the percentage varies as the square of the diameter, I found out that in this one hundred per cent camel's hair coat there was only twenty per cent camel's hair, thirty per cent wool, and the other fifty per cent was a delustered viscose rayon.

Mr. Rose: I would like to ask Mr. Mennerich if other delusterants, such as barium sulfate and the others, can be identified microscopically.

Mr. Mennerich: As I said, I am not an expert along all the lines of rayon and that is something I cannot answer. I imagine the problem can be solved with the aid of the microscope.

Chairman Baxter: I am of the opinion they would show up practically the same way.

ONE HUNDRED AND NINTH COUNCIL MEETING

THE Council held its 109th meeting at the Chemists' Club of New York on Friday, Oct. 16, 1936, in the morning, and briefly in the afternoon. Present were President William H. Cady, presiding; Elmer C. Bertolet, Vice-President; William R. Moorhouse, Treasurer; Louis A. Olney, Chairman of the Research Committee; Robert E. Rose and E. H. Killheffer, Past Presidents; Carl Z. Draves and Donald H. Powers, Councilors-at-Large; Ben Verity, Hans Meyer, R. M. Ritter, and Charles H. Stone, representing Rhode Island, New York, Philadelphia and Piedmont, respectively; and Harold C. Chapin, Secretary. The Secretary's report of the 108th Council meeting was approved. The Treasurer's report of October 15, and the Secretary's balance sheet attached hereto, were accepted.

Proposed amendments to the Constitution, printed on page 624 of the AMERICAN DYESTUFF REPORTER of Nov. 16th, were received for submission to the Annual Meeting.

An arrangement made by the Secretary with the Howes Publishing Co. was approved, whereby after this year, back numbers of the AMERICAN DYESTUFF REPORTER less than two years old will be sold directly by the Howes Publishing Co. The Association will purchase and store 45 copies of each issue. The Secretary will fill orders for issues of 1936 and earlier, and thereafter only for issues over two years old. The Secretary was directed to eliminate from reports submitted for publication, advertising matter other than that contributory to the purposes of the Association stated in the Constitution.

It was voted that a Council meeting be held in Charlotte, N. C., on Saturday, April 17, 1937. An invitation was received from the Piedmont Section through its Councilor, Mr. Stone, for the Association to hold its Annual Meeting in 1938 or spring of 1939, in Charlotte. It was reported that the Southeastern Section also might extend an invitation; so decision was postponed until the next Council meeting.

The Research Committee was authorized to purchase an experimental yarn mercerizing machine.

Each of the following was elected to the class of membership specified, as of thirty days from publication of application, provided no objection be received meanwhile by the Secretary.

Active

W. S. Adams	G. C. Emmons	M. R. Maksim
D. Anderson	E. W. Empting	C. L. Mandelert
N. P. Arnold	H. B. Farquhar	A. Moscowitz
J. H. Atkinson	T. W. Farquhar	W. T. Oliphant
F. M. Aubert	R. Feibelmann	W. A. Perry
J. M. Ballentine	E. A. Friedberg	J. W. Rowland,Jr.
C. H. Caspersen	G. W. Gormley	J. Smith
L. B. Coombs	M. H. Gurley	R. H. Smith
G. M. Cooper	W. H. Hand	R. K. Smith
A. C. Dege	V. J. Hartman	C. O. Throne

Secretary's Balance Sheet—October 13, 1936

	Applications	*Dues, regular and re-instate.*	*Dues, sustain. and contrib.*	*Dues, Corporate*	*Miscel-laneous*	*Bank charges*	*Totals, net*
Received by Secretary, Nov. 1, 1935, to June 11, 1936....	$892.50	$6,947.85	$265.00	$1,925.00	$694.30	—$3.07	$10,721.58
Received by Secretary, June 11, 1936, to Oct. 13, 1936..	310.00	70.00	10.00	75.00	246.05		711.05
Total Receipts	1,202.50	7,017.85	275.00	2,000.00	940.35	— 3.07	11,432.63
Transmitted to Treasurer....	1,097.50	7,007.85	275.00	2,000.00	936.10		11,316.45
Leaving to order of Secretary.	105.00	10.00			4.25	— 3.07	116.18

MISCELLANEOUS ITEMS:			
LaunderOmeter royalties	$48.00	Dyestuff Reporters	29.05
Crock Meter sales	57.55	Dyed standards	20.00
Crock Meter cost rebate.....	17.51	Knitted tubing	21.29
Year Books	52.65	Total	$246.05

J. M. Dziadik, F. B. Hosmer, J. M. Tinker
R. A. Eldridge, M. O. Kremers, T. F. Waechter

Junior

E. L. Dion, H. E. Knox, L. Shapiro
R. F. Jenkins, S. L. Merritt, C. H. Stiteler
J. J. Kimmell, S. Powel, Jr., A. G. Waters

Associate

O. F. Andersson, F. C. N. Jackson, G. L. Morrison
W. D. Deuble, B. Liebovitz, P. H. Plough
C. R. Gill, G. J. Martin, F. C. Scholler
D. H. Harris, A. P. Wandtke

Student

W. F. Fry

Respectfully submitted,

HAROLD C. CHAPIN,
Secretary.

ONE HUNDRED AND SECOND MEETING, RESEARCH COMMITTEE

THE 102nd meeting of the Research Committee followed the Council meeting on Friday afternoon, October 16, 1936. Present were Chairman Louis A. Olney presiding, W. D. Appel, K. H. Barnard, E. C. Bertolet, H. E. Bishop, J. R. Bonnar, W. H. Cady, Hugh Christison, C. Z. Draves, Ralph Hart, B. L. Hathorne, E. H. Killheffer, W. F. Macia, Hans Meyer, W. R. Moorhouse, G. A. Moran, D. H. Powers, R. M. Ritter, R. E. Rose, W. M. Scott, H. D. Smith, Ben Verity, and H. C. Chapin, Secretary. Regrets were received from P. J. Ariente, Alban Eavenson, Ephraim Fredeman, H. F. Herrmann, A. E. Hirst, and J. G. Masson.

The Chairman introduced a discussion of comparison between fastness standards of this Association and the British and German. A letter from P. J. Ariente suggested a wash fastness standard between our 1 and 2 to fit certain moderately fast colors such as some of the diazotized and developed dyes; also suggested standards for fastness of finishes on cotton. Mr. Moran discussed British wash fastness tests in some detail and suggested that through certain changes in temperature these and our own might be brought more nearly into conformity. He, Dr. Rose and Dr. Scott objected to complication of our tests by use of two sets of standards as in the British tests.

Commenting on the light fastness tests, Mr. Cady stated that the German tests, now adopted by British and Swiss, had been changed so radically that it would take some time for fresh comparisons with our own. Mr. Christison gave reasons for preferring our perspiration tests to the foreign, and offered to prepare samples to be sent abroad as proof.

Mr. B. L. Hathorne, Chairman of the Rayon Comittee, introduced Mr. H. E. Bishop, Executive Secretary of the Throwsters Research Institute, and Mr. W. F. Macia, Research Associate in the joint project with this Association on Causes of Variations in Rayon Crepe Fabrics. They discussed their progress to date and reported excellent cooperation from rayon manufacturers, throwsters, weavers, dyers and finishers.

Mr. Barnard, reporting for the new committee on Crease Resistance, stated that the first problem was to set a standard of non-wrinkling cloth. Mr. Appel reported briefly for the committee on Chemistry of Wool Fiber. Mr. Christison reported for the committees on Determination of Oil, Soap, and other Extraneous Matter in Textile Materials, and on Determination of Fibers in Mixtures.

Respectfully submitted,

HAROLD C. CHAPIN, *Secretary.*

MEETING, PIEDMONT SECTION

THE regular fall meeting of the Piedmont Section was held at the Hotel Charlotte, Charlotte, N. C., November 7, 1936, with a record crowd of 320 members and guests attending.

With Chairman Eddy presiding, C. O. Kuester of the Charlotte Chamber of Commerce spoke briefly in welcoming us to Charlotte. P. J. Wood, past president, in his remarks, renounced his Yankee convictions and turned Carolinian, with some Swedish reservations.

The high spot of the evening was Governor-elect Clye Hoey's address. His Excellency assured us that the country was safe in the hands of the Democrats, and that the textile industry need have no fears in any part of the United States, for it is on the eve of a period of increasing activity, in the success of which both the owners and employees shall participate. A Charlotte male chorus at intervals between addresses rounded out the evening's program.

Officers for the coming year were unanimously elected:

Chairman, Thos. R. Smith; V. Chairman, R. E. Rupp; Secretary, A. Henry Gaede; Treasurer, Grady Miller; Councillor, Chester L. Eddy; National Nominating Committee, John L. Crist.

Respectfully submitted,

R. E. RUPP, *Secretary.*

MEETING, NORTHERN NEW ENGLAND SECTION

A MEETING of the Northern New England Section was held at the University Club, Boston, Mass., on Friday evening, November 6, 1936. About sixty members were present and the following program was presented:

"Temperature Control in the Textile Industry"

F. S. Ward and R. D. Cleveland

of the Taylor Instrument Company

"Moths: Their Habits and Control"

Dr. Samuel C. Prescott, Dean of Science,

Massachusetts Institute of Technology

Dr. Prescott's paper aroused considerable interest not only among the wool members, but also amongst those members whose particular interest concerned cotton as he gave considerable advice regarding care of clothes and upholstery material in the home and how they can be protected against the ravages of moths. This meeting was very thoroughly enjoyed by all present.

Respectfully submitted,

JOHN N. DALTON, *Secretary.*

UNEMPLOYMENT REGISTER

Members of this association, who are without employment, should forward to the secretary a statement as to their qualifications and experience. This information will subsequently appear on these pages with an identifying key number. Employers are also requested to file with the secretary or the American Dyestuff Reporter any vacancies which may occur in their businesses.—H. C. Chapin, Secretary, Lowell Textile Institute, Lowell, Mass.

Key: A—Laboratory and research; B—Dyeing or printing; C—Finishing; D—Sales; E—Instruction; F—Executive.

NOTE: PERSONS WHO HAVE OBTAINED EMPLOYMENT SHOULD NOTIFY THE SECRETARY OR THE AMERICAN DYESTUFF REPORTER AT ONCE.

Prospective employers may file vacancies either with the secretary or the American Dyestuff Reporter.

A-B-1

Education—Graduate chemist and colorist from a leading textile institute. Speaks French fluently. High standing at school. Awarded 1st prize in chemistry. Member of honor society.

Experience—Knowledge of most processes of textile manufacturing and some experience in woolen and worsted piece and stock dyeing and color matching. Presently employed in other department but wishes to get into laboratory or dyehouse.

A-B-5

Education—Graduate of the University of Lausanne, Switzerland. Doctor's degree in Chemistry. Knowledge of French and German.

Experience—Eleven years with large bleaching, dyeing, printing and finishing plant as assistant Chemist and then Chemist in charge of the Laboratory. Experience in dyeing and printing cotton and rayon fabrics; research and analytical work. Woman.

A-B-7

Education—Evening school in textile dyeing.

Experience—2 years laboratory in dyehouse; 9 years dyer and foreman on hosiery, ribbons and rayon; 2 years assistant to superintendent. Can handle help efficiently. Desires position as supervisor or demonstrator of dyestuffs. Age 30; married. Prefers vicinity of New York.

A-B-C-1

Education—B. S. in Chemistry, Massachusetts Institute of Technology.

Experience—7 years with a prominent worsted mill as assistant chief chemist, chief chemist, and superintendent of dyeing and wet finishing. Thoroughly familiar with chemical problems of worsted industry. Age 33; single. Location unimportant.

A-B-C-2

Education—Graduate of Lewis Institute of Engineering of Chicago and graduate of Philadelphia Textile School (Chemistry and Dyeing department).

Experience—Has had extensive experience as assistant chemist and colorist in silk printing, dyeing and finishing; also dyeing raw stock wool; and dyeing and finishing cotton and rayon. Age 30; married; references.

B-3

Experience—Foreman piece dyer for the past 21 years. Can dye the following: celanese, rayon, cotton backs, wool, silk and mixed fabrics. Has knowledge of finishing and laboratory work.

B-F-1

Experience—As executive had charge of the dyeing of ribbons and piece goods for 6 years; spun silk yarn, fast and resisted dyeing for 8 years; hosiery for 12 years. Has been quite successful in all three of these mills. Age 50 married. Will go anywhere.

AMERICAN
DYESTUFF
REPORTER

LOUIS A. OLNEY, Sc.D.
Professor of Chemistry and Dyeing, Lowell Textile Institute
Directing Editor

A. P. HOWES
Publisher

NORMAN A. JOHNSON
Managing Editor

MYRON DREW REESER
Advertising Manager

Published biweekly by
HOWES PUBLISHING CO., INC.
440 Fourth Avenue, New York City

Subscription price: $5.00 per year; Canadian $6.00, foreign, $6.00

Vol. 25 December 28, 1936 No. 26

MORE ON GETTING ALONG WITH PEOPLE—III

General Behavior

IF you have a position in a textile mill or laboratory, unless you are in strictly routine work, you are probably in something in the nature of a service job. That requires a will to please, probably some tact, and perhaps some salesmanship.

A man I know began work in a mill laboratory without any particular assignment except to become of use to the mill organization, and this in the days before mills had laboratories or mill men had experience with chemists. He set out with the definite plan of trying to do anything that anybody in the mill asked him to, with the thought that small services might lead to greater ones and to a recognized place in the company organization. He really succeeded.

Some of the things having to do with getting along with people in general have special importance in such a business connection as a position with a mill. General behavior is, of course, one.

No doubt the best way to behave in your contacts with other people is to be as nearly natural as possible unless you have some trait or habit which you can see will be a handicap. To try hard to make a good impression is too transparent except in the widely experienced. To appear to think too much of yourself does not go too well with most people, while to try to be too democratic out in the mill is not good either. I have seen fellows who thought that it was the smart thing to act like the mill help but it was too clearly unnatural, or they did the wrong things.

It is too easy to do a little showing off and to get laughed at. If necessary to think about it, seek a happy medium. You may find a difference of opinion here but it seems better to make no particular impression at all than one that is definitely bad.

One can hardly be too friendly and agreeable although there may be an exceptional case where it would go too far. In one position as chemist a man thought it best not to join fraternal orders in his mill town although it was suggested by foremen in the mill. It might have promoted friendly relations or it might have stood in the way of making necessary criticisms or suggestions in certain departments.

Such things are matters to think about and to decide according to each situation. There are no rules. We have seen people whose ideas of fraternity and brotherly love seemed to be to expect help in cheating in examinations, or to be let alone in the specification of uneconomical, if not dishonest, supplies. It may be easy to be a good fellow but not always so easy to do your job as your employer expects you to.

You can see faults in others. To see them in yourself is perhaps the most difficult part of education and a part that is probably never completed.

Some people want to appear "high and mighty" and seemingly can never see that they themselves are the only ones that take it seriously. Of course this is not said with the thought of detracting from any serious minded executive who really knows his stuff. It is more likely that those who put on the most "front" are among those that know the least. Learn from such things that if you get that way you will only be kidding yourself.

Sometimes the aloof professional air goes well for a time. You are let alone and seem to be getting away with it. But, to be successful you do not want to be let alone —you must work with other people.

Enthusiasm is a great asset, but you do not need to have the great big enthusiasm today which is liable to blow up and to be as dead as the proverbial doornail tomorrow.

Don't go running around with a big idea. Cool off—estimate the pro's and con's—then suggest it if it still looks good. There is no greater laughing stock around a mill than the fellow that is going to revolutionize the business with a big idea every few days.

Avoid receiving unnecessary confidential information. It is flattery to be told things in confidence and it flatters the other person to be able to divulge such matters. However, it is safer to try to avoid things that are actually confidential. It is too easy to forget that they are confidential and to let out the secret.

This, of course, is a subject without any fixed rules. If your confidant tells everybody "in confidence," the leak is not likely to get traced back to anybody but himself.

A lot of secrets are not secret at all and it may be just as well sometimes to conspire in the mystery and get what you can out of it.

You have probably noticed that a technical conversation may sometimes become a showing-off contest. Usually that gets you nowhere. You can't prove yourself superior to the other fellow, at least to his satisfaction,

and as for yourself, you know it already. Again—you are working for or with him and he probably does not care for superior people although perhaps willing enough to use superior knowledge if presented in an acceptable way.

You probably know that it pleases some people to let them tell you something. Perhaps you are working with some one like that. All right, let him tell you but be smart enough to steer the conversation around to something that you want to know about. You are then also in a more favorable position to ask for help or cooperation, having shown that you are not a "know it all" and perhaps having allowed the other person to flatter himself a little. Even if it does seem to be at your expense why worry if you accomplish your purpose?

Some people seem naturally to have horrible business manners. As a department head I once completely designed and supervised the installation of a complicated pipe and pumping system and then had a superintendent try to verify my statement about it by asking the help in front of me. He should have been told a few things right then and there but, knowing the man, I decided to keep the peace and console myself with the thought that he didn't know any better.

Such a man merely shows himself up by such thoughtless and irritating behavior.

Do not be too secretive. Usually the mystery man is merely showing off, if not actually ignorant himself. If you are out in the mill on a job and have to take notes, those that are really confidential can easily be kept out of sight. Otherwise it is frequently just as well to leave notes that you make while in the mill lying around a little—not carelessly but enough to allay any suspicion that you are trying to get something on somebody.

Regardless of all the possible do's and don'ts the most important thing is to study people, see how they act, find out what other people think of them, and see what they succeed in accomplishing. Then you can try to do or do not likewise.

—♦♦—

Studies on Determination of Sulfate and Sulfuric Acid on Wool

(Continued from page 722)

with carbon tetrachloride, then with alcohol, and then water.

For the sodium sulfate study, samples of about 2.5 gms. of this purified yarn were used, one being thoroughly wet out in a 4 per cent solution of $Na_2SO_4.10H_2O$, and the other in a 10 per cent solution of $Na_2SO_4.10H_2O$, then squeezed by hand in a clean dry towel, air dried, and baked for two hours at 110° C.

For the sodium bisulfate study, 2.5 gms. of the same yarn were soaked in a 4 per cent solution of fused sodium bisulfate, squeezed, dried and baked as above. These were given the same number of digestions and in the same manner as was done on carbonized wools (Table 2).

The sulfate in the washings from sodium sulfate digestions was determined gravimetrically and from the sodium acid sulfate digestions by titration with 0.1N sodium hydroxide using phenolphthalein indicator. The sulfate in the samples after these digestions was determined by the Mease method after neutralization of the acid used for hydrolysis. The results appear in Table 5.

As expected, sodium sulfate is readily removable. Sodium acid sulfate acts quite like sulfuric acid.

CONCLUSIONS

A quick method for determination of sulfuric acid on wool, sufficiently accurate for mill control work is here presented, with some observations on the rate of removal of sulfuric acid, sodium sulfate and sodium acid sulfate. Some precautions to be observed in gravimetric determinations of sulfuric acid are noted.

TABLE 5

Liquor and Washings from:	*Previous Treatment of Yarn*	*Equivalent of H_2SO_4 per gram yarn Dry Basis*
First	4% $Na_2SO_4.10H_2O$	0.0131 g.
Digestion	10% $Na_2SO_4.10H_2O$	0.0228
1 hour	4% $NaHSO_4$	0.0547
Second	4% $Na_2SO_4.10H_2O$	0.0002
Digestion	10% $Na_2SO_4.10H_2O$	0.0002
30 Min's.	4% $NaHSO_4$	0.0015
Third	4% $Na_2SO_4.10H_2O$	0.0001
Digestion	10% $Na_2SO_4.10H_2O$	0.0001
30 Min's.	4% $NaHSO_4$	0.0007
Fourth	4% $Na_2SO_4.10H_2O$	0.0001
Digestion	10% $Na_2SO_4.10H_2O$	0.0000
30 Min's.	4% $NaHSO_4$	0.0007
Fifth	4% $Na_2SO_4.10H_2O$	0.0003
Digestion	10% $Na_2SO_4.10H_2O$	0.0000
About 20 hrs.	4% $NaHSO_4$	0.0011
	4% $Na_2SO_4.10H_2O$	0.0013
Mease	10% $Na_2SO_4.10H_2O$	0.0013
	4% $NaHSO_4$	0.0014

REFERENCES

[1]Determination of Acids in Wool—S. R. Trotman and G. N. Gee. Am. Dyestuff Reporter, p303 (1933).

[2]Determination of Sulfuric Acid on Wool—J. Barritt, Journ. Text. Inst., PT87 (1935).

[3]Determination of Sulfur and Sulfate in Wool—Ralph T. Mease. Research paper R.P. 731, National Bureau of Standards.

[4]Popoff & Newman—Ind. Eng. Chem. Anal. Ed. p45 (1930).

[5]Hirst & King—J. Soc. Dyers & Colorists, 1926 *42*, 171.

We are indebted to Dr. Milton Harris, Dr. Harvey A. Neville, Arthur L. Smith and Ralph T. Mease for their kindly suggestions and criticism.

Non-Hardenable Austenitic Chromium-Nickel Steel

Known As "Stainless Steel"

Explaining Certain of its Characteristics and Properties of Textile Interest

HENRY BARKER BURKE

(*All rights reserved by the author*)

IRON was available to the primitive metallurgist, who burned out its impurities to produce a tough fiber-grained metal which could be wrought and forged. In this form iron is still used today, and is known as Wrought Iron.

A stronger metal was produced by the prolonged heating of this Wrought Iron in a bed of charcoal from which it absorbed carbon. The carbon gave it a fine grain and this treatment converted the Wrought Iron to Steel Iron. Then stronger and tougher steels followed. This was attained mainly by varying the carbon content. At first the methods of production were applicable to only small quantities but with the development of the Bessemer process, in 1856, it was possible to produce in large quantities, steels suitable for a variety of industrial uses—structural purposes, boiler plate, rails, etc. Quality steels were still produced by the Crucible process.

Coincident with start of the automobile industry the demand for alloy steel developed in quantity and improved methods of production were devised. The electric furnace was installed in the Halcomb Steel Company in 1905, and its development was rapidly successful as applied to quality steels, so much so, that practically all this class of steel is today made by this method. Such is the brief history of the ferrous group of metals and today it might be said that we are living in the Age of Alloys.

In a sense all steels are alloys of iron. But the alloy steels (which include Stainless Steel) have some metallic element or elements in addition to the five elements (carbon, manganese, silicon, phosphorus, sulfur) which are to be found in varying proportions in all irons and steels. The difference in these ferrous metals (steels) is chiefly chemical, and their physical characteristics vary according to the proportioning and changing of their chemical ingredients.

For illustration consider the following approximate analyses:

	Low carbon machinery steel (1010 *S. A. E.*)	*High carbon tool steel* (1095 *S. A. E.*)
Carbon	.05% to .15%	.90% to 1.05%
Manganese	.30% to .60%	.25% to .50%
Silicon	.01% to .02%	.01% to .02%
Phosphorus	.045% Max.	.04% Max.
Sulfur	.05% Max.	.05% Max.
Iron	99.545 to 99.135%	98.74 to 98.34%
Tensile strength	60,000 lbs.	120,000 lbs.

The sensitiveness to any change in formulae can be seen in the above figures where by varying the chemical content but slightly, especially through increasing the carbon, a steel is produced of double the tensile strength.

All ferrous metals (steels) start from the same base—iron. By varying the chemical ingredients, the steels are developed progressively stronger and tougher from low carbon through high to the latest forms of alloy steels. The carbon content of plain carbon steels varies from .05% to 2%. The maximum strength is obtained at around .90% carbon. Higher carbon content doesn't effect the strength but does increase the brittleness and wear resistance. Toughness and ductility decrease as the carbon content raises, that is the low carbon steels are generally tougher and more ductile but not as high in tensile strength. However, the carbon content and the heat treatment are generally so balanced as to give the desired properties both in respect to strength and ductility.

Prior to the introduction of Stainless Steels, there were steels developed which held a varying content of both nickel and chromium—both high and low in amounts. In fact, Michael Faraday about the year 1820 had produced some seventy-one different alloy steels. Of these, an alloy containing 3% nickel is recognized today as a leader in its field. In the early 1870s Mushet produced a high speed steel based on the use of tungsten as an alloying element. But no practical use was made of this or the discoveries of previous investigators until the 90s when Taylor and White evolved a high speed cutting tool steel through heat treatments and modification of Mushet's formula. This led to expanding work on alloy steels and the time being ripe for the utilization of such products much of practical value was developed.

In 1912, Brearley in his work to perfect British ordnance through developing an alloy which would resist the corrosive action of sustained gun-fire, added chromium to his steel and found the metallurgist's dream of years—a steel which actually resisted rusting. This was the first development of Stainless Steel, and as developed contained about 12% chromium and .30% carbon. It was used in ordnance and industrially by the cutlery trade.

During the war period Strauss in Germany developed a steel containing both nickel and chromium and found it vastly superior to Brearley's product in point of resistance

to corrosive agents and greater ease of workability. These two discoveries mark another era in the development of steel, the importance of which is as yet not fully realized even by the steel companies themselves.

In fact, the whole world was slow to grasp the importance of this development and none more so than the United States. In 1920, Dr. C. M. Johnson of the Crucible Steel Co. of America published a paper in the transactions of the American Society for Steel Treating entitled "Properties and Microstructure of Heat Treated Non-magnetic, Flame, Acid and Rust Resisting Steel", which marked the first publication in this country of any data on this new class of steels.

Of course much technical study and promotional effort was carried forward during the next ten years but the first really comprehensive and authentic review of the physical and chemical properties (data) published on corrosion resistant steels was under date of April 17, 1930, by the Iron Trade Review. Their data was taken largely from the Krupp Nirosta Co., Inc., New York City with fabrication methods from the then principle licensees (Crucible Steel Company of America). Reprints of this were circulated widely.

So it can be seen that the subject is in reality quite new to the world and very particularly so to the potential industrial user of the alloy. Some few steel companies availed themselves of the rights to manufacture and sell this type of steel quite early in its introduction here in United States, but so important a company as the United States Steel Company was not licensed until 1931. While the use of the alloy has been actively promoted among the automotive, food utensil, and building trades as yet nothing more than special applications have been attempted in the paper and textile field, both of which hold innumerable possible applications.

These steels (corrosive and heat resistant) were first produced by Krupp of Germany and were designated as KV2A—KV4A—etc. They were subsequently introduced into this country by the Krupps under license and are today made in this country under license by those companies selling this type of steel. The product is sold under a trade name, each company having some identifying trade name registered in its own right.

One of the first outstanding uses to which this new steel was put was in the decorations of the Chrysler Building, New York City, where the Crucible Steel Company supplied what was then designated as KA2 (KA2 is an abbreviation from Krupp's Austenitic No. 2). This was essentially 18% chromium and 8% nickel in alloy with a low carbon steel and was soon popularly referred to in this country as 18-8. This 18-8 referred to is the general all purpose type. To bring the alloy to meet certain exacting requirements modifications in formulae and certain basic introductions have been made as required. There are now many types of Stainless Steel available.

The three principal carbon ranges of Stainless Steel and also its molybdenumized alloy are given to acquaint the reader with the variations of the 18-8 analysis. These are the types of most general interest to the textile trade, especially in the wet processes. It is to be noted that Type III has been supplanted almost wholly by the molybdenumized type. (see table at bottom of page).

While the molybdenum type has in general a slightly higher strength and lower ductility than Types I, II, and III, the physical properties of the above types are substantially as follows:

Tensile strength	85,000/95,000 lbs. per sq. in.
Yield point	30,000/40,000 lbs. per sq. in.
Elongation in 2"	55/60%
Reduction of area	65/75%
Brinell Hardness	130/170
Charpy impact	100 ft. lbs.

The tensile strnegth of these steels cannot be increased by heat treatment, but can be greatly increased through cold working of thin sections. In fact, it is possible to obtain a tensile strength as high as 200,000 pounds per square inch in cold rolled strip and as high as 250,000 pounds per square inch in cold drawn wire. They harden on cold working and therefore a rubbing contact can produce a work hardened skin surface which is quite resistant to abrasion. They have a coefficient of expansion about one and one-half times that of plain steel. It should be noted that Type III has been almost wholly supplanted by Type IV for textile chemical recommendations.

The Stainless Steels of the 18-8 type are non-magnetic and austenitic in character. The iron in irons and steels assumes such crystalline form as its relation to the critical temperature of transformation dictates. Above the critical temperature (906° C) the form is known as gamma iron; the carbon and other elements being dissolved in this gamma iron to form austenite. Below the critical temperature (768° C) of transformation the form of iron is known as alpha iron and carbon is rejected as carbide. Chromium or other elements present may remain in solution and this solution is known as ferrite. (There is still great uncertainty as to the conditions of iron between 768° C and 906° C).

Therefore, an austenitic steel is one where all of the

	Type I *Low Carbon* 18-8	*Type II* 18-8	*Type III* *High Carbon* 18-8	*Type IV* 18-8 *Molybdenum*
Carbon	.07	.15	.25	.07
Manganese	.40/.65	.40/.65	.40/.65	1.50
Phosphorus	.035	.035	.035	.035
Sulfur	.035	.035	.035	.035
Silicon	.30/.75	.30/.75	.30/.75	.30/.75
Nickel	8.00/9.50	8.00/9.50	8.00/9.50	8.00/10.00
Chromium	17.00/19.00	17.00/19.00	17.00/19.00	18.00/20.00
Molybdenum				2.50/3.50

elements in the steel are in solution in the gamma iron, which is the result when the steel is not cooled too slowly from a temperature around 2000° F. At or above this temperature carbon of the Stainless Steels is in complete solution, and if brought to room temperature rapidly, as for example, air cooling of thin sections or water or oil quenching for large sections, the carbon remains in solution at room temperature.

Austenite is extremely ductile and non-magnetic while ferrite is crystalline and magnetic; in fact, iron is magnetic only in the ferrite form. Several alloying elements have an important bearing in regard to maintaining the austenitic condition of steel down to ordinary temperatures, of which (not to go into any great detail) nickel tends to preserve the austenitic condition beyond that of other elements. It also contributes materially to the non-corrosiveness of the alloy. Chromium tends to limit the austenitic condition. However, chromium more than any other metal (element) develops and preserves the non-corrosive features through its remarkable capacity to form a highly protective passive film. Titanium, molybdenum and columbium all have a strongly stabilizing effect on the austenitic condition by tending to hold the chromium in solution.

Iron and steels have always developed one serious defect. They rust. In common with other elements iron has the tendency to go into solution in water. When the iron ions go into solution, however, they replace some other ion which is in solution, and this ion is in turn plated out on the iron. For example, in the case of copper plating, iron goes into solution and copper is plated out of solution onto the iron. In pure water, the only material which can plate out onto the iron is hydrogen. This hydrogen is oxidized to form water, and thus removed from the surface of the iron, allowing more hydrogen to plate out of solution. The iron which goes into solution forms ferrous hydroxide which in turn is oxidized to ferric hydroxide and this gradually transforms to hydrous ferric oxide, commonly known as rust. In the case of acids, the hydrogen ion concentration is much greater than it is in pure water, and therefore, there is a greater tendency for the hydrogen ion to plate out onto the surface of the iron, which explains the increased rate of corrosion in acid solutions. This is the basis of the electro-chemical theory of corrosion and most investigators today agree that this theory in some form is the true answer to this problem (corrosion).

Stainless Steel, however, upon being exposed to the atmosphere or any other oxidizing agent, immediately forms a passive film (an oxide film) which insulates the metal body from contact with the corroding medium. The theory of the Passive Film is well founded in fact. It is undoubtedly electro-chemically produced. Its peculiar characteristic is that it never gets to be more than a microscopically thin layer of corrosion which does not increase in thickness and which unless broken in some physical or chemical manner prevents all further corrosion. The film does not effect the appearance of the surface of the metal. This film is assumed to be self-healing to a degree.

All corrosion resistant steels are such because their alloy content favors the development of this tough, passive oxide film. While this film forms normally by itself it can be hastened by an immersion in cold 20% nitric acid for 30 minutes, (the most suitable temperature being 150° F). This is known as passivating. This nitric acid dip should be followed by a thorough washing in cold water to prevent the staining of the metal surface. Passivating does not effect the appearance of the polished surface, and, in fact, should always be used after polishing, grinding, shearing, cutting and machining as it removes any particles of the cutting or grinding tool, or abrasives which may have become imbedded in the work. It is likewise good practice to passivate after all fabrication or even after any severe handling.

Steels of certain types are subject to a rather peculiar form of corrosion known as Intergranular Corrosion and because of their composition the Stainless Steels are susceptible to this form of corrosion. It is not common in terms of frequency as compared to ordinary forms of corrosion but it has been the cause of much of the failure in Stainless Steels, and still continues to be, although such failures are more than often diagnosed simply as improper recommendations. This type of corrosion can be controlled generally by the shop thru proper manufacturing procedure and precautions. To eliminate the uncertainty and hazards in connection with certain applications a stabilized form of Stainless Steel is recommended, generally the molybdenum alloy with low carbon content.

The 18-8 molybdenum type, besides being the most resistant to intergranular corrosion, also has the highest resistance to general corrosion of the 18-8 type Stainless Steels. This molybdenum type 18-8 is resistant to a great variety of corrosive agents under various conditions of temperature and pressure, and is being widely used at the present time for tanks, vats, etc., in the textile industry, because of the high factor of safety which it provides.

To better understand this phenomenon and its control, the general physical composition of an iron alloy should be clearly in mind. From suitably prepared samples it is disclosed microscopically that the chemical ingredients in these ferrous alloys lie between flat sided grains or between the crystals of each grain. Here the carbon and the iron may be in the form of iron carbide. Or, it may be as graphite. Other components as phosphide, sulfide or silicide of the metal may be present. Pure iron can dissolve about 7% of carbon and in solidifying it may completely throw this out of solution (on the average the maximum retained is 1.7%). Of course, temperature and other chemical ingredients are controlling factors determining the extent and form of this precipitation.

The susceptibility to Intergranular Corrosion is due to the precipitation of chromium as carbide at the grain boundries. If the metal has been previously cold worked

there will also be chromium carbide precipitated at the slip plates (between the flat surfaces of the crystals) as well as at the grain boundries. Now, if conditions can be produced so this chromium carbide can diffuse into the depleted areas the resistance to this form of corrosion is restored. In steels where this carbide accumulation has taken place exposure to active electrolytes will result in corrosion at the grain boundries and the steel becomes very brittle in these areas and disintegration of the metal in irregular patches varying in extent may result when subject to impact or shock or even undue vibration.

The metallurgist may lower the carbon content and thus eliminate to some degree the tendency to excessive carbide formations or he may limit these formations through chemical means as already referred to, by the introduction of some controlling elements, (*titanium, molybdenum, columbium*). It has been found that if the carbon content is kept below .07% there is insufficient carbon present to cause carbide precipitation, and the effect of such precipitation is almost negligible. This will explain the recommendations for the molybdenumized alloy of low carbon content in preference to other types of Stainless Steels for textile work.

Temperature is the real key to this subject. When the metal (any non-hardenable austenitic chromium nickel steel) is cooled slowly through a range of temperature from 1600° F to 1000° F carbide will form at the grain boundries. If this carbide is not diffused it will result in Intergranular Corrosion. Certain shop operations develop this dangerous range of temperature. Welding is the most common, as the weld is ordinarily left to adjust itself to normal temperatures. Now, if the metal is rapidly cooled from a temperature where the carbon content is entirely dissolved in the iron (say 1850° F and upwards), the carbide is completely diffused and there is no precipitate.

From a practical point of working these metals it is dangerous to dwell at the 1600° F to 1000° F range and in absence of any specific procedure if the work has been subject to this temperature range, reheat and cool rapidly (cold water) as a safeguard against this form of corrosion. This procedure (reheating) will also effect the complete removal of all stresses and strains set up through working, eliminate recrystallization, develop a uniformity of softness as well as dissipate the carbide formations mentioned.

The variables entering into every problem of corrosion testing are such that samples of the material to be used should be tested under practical conditions. The impurities in the metal, the strains developed in process and the possible rearrangement of its crystalline structure under commerical conditions might exert an effect which would be wholly absent in laboratory tests. While Stainless Steels are outstanding in their inertness and resistance to corrosive action no prediction of such resistance can be definitely established without practical working tests.

However, in Stainless Steel, we have a steel which through passivating and homogenizing to maintain its protective film and to retain its particular crystalline form is immune to all types of corrosion common to the irons, carbon, and alloy steels. In addition, the extended list of chemicals to which it registers nearly absolute corrosion resistance, together with those chemicals where there is little corrosion from the point of practical applications (the chlorides being the only alarming exceptions) make it stand apart for industrial and textile work.

BOOK REVIEWS

Book of A.S.T.M. Standards issued triannually. Part I on Metals. Part II on Non-Metallic Materials. Part I 898 pages and Part II 1477 pages. Part I $7.50. Part II $7.50. Part I and Part II orderea together $14.00.

The Book of A.S.T.M. Standards is published every three years and contains all of the standard specifications, methods of test, definitions and recommended practices adopted by the Society.

The 1936 edition is in two parts. Part I giving in their latest form all A.S.T.M. Standards covering metallic materials and Part II on Standards relating to non-metallic materials.

In each part, the specifications for a particular class of material are given first, followed directly by the test methods, definitions, etc. A complete subject index lists each standard under the principal subject covered, with the keywords in alphabetical sequence. This index, together with two tables of contents, one listing standards by the materials covered, the other in order of sequence of the serial designations facilitates the use of the book.

Copies of the book in blue cloth binding can be obtained from A.S.T.M. Headquarters, 260 S. Broad St., Philadelphia, Penna.

The Principles and Practice of Textile Printing, by Edmund Knecht and James B. Fothergill. 3rd edition. 1048 pages, 109 cuts and more than 200 printed swatches. Price $35.00. Published by J. B. Lippincott Co., Washington Square, Philadelphia, Penna.

Probably no branch of the textile coloring industry has developed so rapidly and changed so completely in the last few years as that of textile printing. Many of the processes which were depended upon twenty-five years ago have become of minor importance, whereas many other processes which were not used at all, at that time, constitute a very large proportion of the whole textile printing industry. This is particularly true of the rapid developments which have been made in connection with vat and the azoic groups of dyestuffs. These developments have resulted in the production of prints which are much faster to washing and also to light, and the average run of prints

of a few years ago are scarcely to be compared as regards value with those produced today.

The volume under consideration is the most complete book on the subject of textile printing that has been published in any language. An endeavor has been made by the authors to bring it as completely up-to-date as possible and as compared with earlier editions it is practically a new book. The first two hundred pages are devoted largely to the mechanical aspects of bleaching, dyeing, and printing, and the remainder of the book largely to the description of specific processes. The section in regard to the printing of wool, silk, rayon, and mixtures of these fibers has been greatly extended as compared with earlier editions. At the end of the book there are various tables of value to the printer.

While the cost of this book at first thought appears to be somewhat high, examination soon indicates that for a technical book including so many specially prepared cloth samples, it is reasonably priced. Furthermore, it contains in one volume information that otherwise would have to be brought together from numerous sources and to some extent unobtainable otherwise.

This book will prove indispensable to every scientific and progressive printer, and should be available to those who have the responsibility of developing new features and in securing the best results in printing.

TECHNICAL NOTES FROM FOREIGN SOURCES

Decomposition of Hydrogen Peroxide in Alkaline Solution and Its Importance in the Bleaching of Cotton

Dr. Chr. Doerfalt—Monats. f. Textil-Ind. 50, 37 (1935). —Practically all methods of bleaching are oxydative methods (although D. R.—P. No. 570,022 recommends a reductive process before the oxydative process is carried out). Even the almost prehistoric lawn-bleach of linen is a process of this sort, it being now known that the effective agent, atmospheric oxygen, is converted in minute quantity to ozone, under the influence of the ultra-violet rays of sunlight, and especially in the presence of the moisture with which the air on the surface of the ground is laden. Modern practice, of course, imperatively demands a quicker process, and one which can be carried out with large quantities of goods in a comparatively restricted space; and so the modern industry has developed. There are practically only two methods employed in modern bleaching: with salts of hypochlorous acid, and with hydrogen peroxide. The former is the older method, and is still more extensively used, because of the cheapness of hypochlorites. It involves certain disadvantages, which are not inherent in the peroxide method. It brings about a certain weakening of the fiber through production of oxycellulose, which may lead to a serious loss of material; and, in addition, a troublesome process, that of kiering, is necessary, to remove certain incrusting substances naturally and always present in the raw fiber.

With the peroxide bleach, the oxydative process (which ideally should act only upon the impurities in the fiber, and not at all upon the fiber itself) is more certain and definite in its action. No residue is left to remain more or less as a sludge which may adhere irregularly to the clean fiber, the fiber is attacked to a less degree, and the process as a whole is more rapid, since the kiering and bleaching can take place together. The final result is fully equivalent in quality to that of the hypochlorite bleach. Yet there are two reasons why the peroxide method has had to fight its way into use—one, the higher cost of the preparation to be used, the other, the fact that only a small part of the peroxide used is actually utilized, because of its rapid decomposition in alkaline solution by substances (frequently occurring in the apparatus commonly used) which proves to catalyze its decomposition into gaseous oxygen and water. This loss as gaseous oxygen is serious in extent, yet the strong alkalinity of the bath cannot be avoided, since the alkali promotes the bleaching action by swelling the fiber and loosening the incrustations, and bringing the fiber into the ideal condition for the actual bleaching.

The catalytic breaking down of peroxide has been largely overcome by the use of construction-materials not possessing catalytic properties. Lead, nickel, aluminium, and certain kinds of steel have been found to be without this objectionable action, as well, of course, as enamelled vessels and glazed earthenware. Iron vessels are also quite suitable when lined with a lime-cement mixture.

As to the difficulty encountered when working with alkaline solutions of peroxide, which, as mentioned above, cannot be avoided, several stabilizing agents have been found effective—water-glass, sodium pyrophosphate, magnesium salts, and their mixtures with silicates, sodium pyrophosphates, or sodium chloride. Organic substances have been found to possess this stabilizing power; notably, gelatine. But this whole part of the subject has not as yet been thoroughly worked out.

In what follows in this section of the paper, the chief topic is "Measurement of the Velocity of Decomposition of Hydrogen Peroxide in Soda-alkaline Solution with and without Stabilizers" (over 31 references to papers already published, dealing with different aspects of the subject), including a description of the methods of study employed, and detached notes upon the velocity of decomposition of peroxide in presence of caustic soda. Two graphs are included under the above subsection. The paper is to be continued.

The discussions in the main part of this section are carefully and thoughtfully worked out, and are of great importance for the comprehension of any theory of the chemical mechanism involved in the use of peroxides.

TRADE NOTES — NEW PRODUCTS

• ANNUAL DINNER A.S.A.

Henry I. Harriman, just returned from a series of international conferences abroad, took the European situation and its application to America's problems as text for his address at the Annual Dinner Meeting of the American Standards Association on December 9 at the Hotel Astor, New York. Mr. Harriman, chairman of the board of the New England Power Association, is a former president of the Chamber of Commerce of the United States, and is a member of the Advisory Committee of the American Standards Association, which serves as the national clearing house for standardization and safety code work in this country.

Prior to the address, Dana D. Barnum, president, Boston Consolidated Gas, reviewed the Association's work for the year. "Industry and government have reached a high degree of cooperation in their numerous joint activities in the American Standards Association," Mr. Barnum said, using as an illustration the forty industrial safety codes, now the backbone of state regulations for the protection of workers in this country. "These codes," he added, "have brought about a large degree of uniformity among the various states, not only to the benefit of employers, but to industrial and insurance groups as well."

During the year the Association approved 33 new standards and 33 revisions of standards previously adopted. This brings the total of American Standards to 357 in the fields of civil, mechanical, and electrical engineering, metallurgy, chemistry, textiles, oil and paper, and other industries.

Mr. Barnum announced that five national organizations have joined the Association during the year, a striking indication of industry's confidence in the work. This brings the total membership of the American Standards Association to 56 national organizations, including technical societies, trade associations, and departments of the federal government; and some 1,800 companies. The new members are: *Industrial Safety Equipment Association, Metal Lath Manufacturers Association, National Association of Motor Bus Operators, Association of Gas Appliance & Equipment Manufacturers, American Gear Manufacturers Association.*

"Both industry and government are calling upon the American Standards Association to extend its operations," Mr. Barnum said. He spoke of the vast new undertakings in several fields, including the formulation of a national building code; development of a series of codes for the prevention of occupational diseases such as silicosis; and specifications for consumer goods sold across the counter in retail trade.

Officers elect are:

Dana D. Barnum, president, Consolidated Gas Company, Boston, president (re-elected.)

Edmund A. Prentis, Spencer, White & Prentis, Inc., New York, vice-president (re-elected).

• GEIGY RELEASE

As has been customary Geigy Company has prepared formulas for the Spring 1937 Hosiery Shades.

They have gone a step farther this season, making their suggestions on Chiffons, footnoted with suggestions for variations in formulas to produce these shades. Copies of these formulas are available upon request.

• USE OF NICKEL ALLOYS

The uses of Monel and other high nickel alloys to defeat corrosion in gas plants are described in a new semi-technical bulletin just issued by The International Nickel Company.

The bulletin comprises 20 pages and contains detailed information on mechanical and corrosion resistant properties of Monel in its several forms as well as on Nickel and some of the newer alloys such as Inconel. It is illustrated throughout and the authors have drawn on actual applications of the metals to emphasize their value in meeting a variety of problems encountered in the manufacture and handling of illuminating gas. It is available without charge on request to the Editorial Department of The International Nickel Company, Inc.

• VISIT ENLARGED DUPONT LABORATORY

A group of trade paper editors from New York City made a personally conducted tour of the newly enlarged technical laboratory of the duPont Company at Deepwater, New Jersey on December 15. It is stated that the addition, which increases the space of the laboratory by about 50%, will make possible more efficient testing of dyes and more comprehensive and thorough treatment of the problems presented to the laboratory by the textile industry.

The technical laboratory is a service organization connected with the dyestuffs sales division and is devoted to the solution of problems in dyeing and finishing which confront the textile mill operator. All of the commonly used methods of dyeing are employed at the laboratory—package machines, raw stock machines, jigs, padders and printing machines are used to test the application of dyes, based upon actual mill conditions. Fastness and standardization tests are made to insure uniform quality.

In addition to dyes for textiles, the laboratory also maintains equipment for testing under factory conditions dyes used by the paper, leather, printing ink, typewriter ribbon and other industries.

The purpose and functioning of the laboratory were explained to the editors by Dr. R. E. Rose, director of the laboratory, and at a luncheon Ambrose Chantler, director of dye sales, explained the service which the laboratory performs in solving dyeing problems.

• AKTIVIN RELEASE

The Aktivin Corp. announces release of the following product:

Flexin P—a new assistant for the finishing of textiles such as viscose rayon, acetate rayon, hosiery, knit goods, cotton goods, etc. It is stated that a surprisingly small quantity of this finishing agent gives four combined effects which makes it very valuable in the processing of textiles, namely: softness, body, smoothness and clarity. It is said to eliminate rancidity in the finished material even when used with oils or fats to considerably reduce the amount normally required. The emulsion is stable except in the presence of mineral acids.

CLASSIFIED

The rate for "Position Wanted" advertisements in this column is 2 cents a word—with a minimum of 50 cents per insertion. For all other types of advertisements—i.e., help wanted, machinery or supplies for sale—the rate is $5.00 per column inch or less per insertion.

POSITION WANTED: Dyer or demonstrator. Experience: Three years worsted and union dyeing, eight years rayon and acetate dyeing. Technical training. Married. Will go anywhere. Write Box No. 933, American Dyestuff Reporter, 440 Fourth Ave., New York, N. Y.

SAPAMINE KW

Patented

A MOST NOTABLE CONTRIBUTION OF SCIENCE TO THE TEXTILE INDUSTRY

SAPAMINE KW HAS A THREE-FOLD USEFULNESS

IT SOFTENS ALL TEXTILE FIBERS WITHOUT ADDING GREASE, OIL OR ODOR

IT MAKES DIRECT DYEINGS FAST TO WATER, ELIMINATING DRYER STREAKS AND BLEEDING.

IT CONTROLS THE DYEING OF BASIC DYES, GREATLY DIMINISHING CROCKING AND AIDING PENETRATION.

As its name indicates, SAPAMINE KW is a salt of a soap-like amine, which has a substantive attraction for all the textile fibers. In this respect it differs from other finishing materials, which are only superficial applications and usually depend for their softening properties upon the presence of oils and greases, with their attendant odors. The fine soft hand imparted to the goods by SAPAMINE KW cannot be duplicated in any other way; it has met with instant approval by the dress goods industry, but is of equal value for men's wear, overcoatings, knitting and carpet yarns; in fact wherever a soft finish will add to the value of the goods.

Sample and circular mailed upon request

CIBA COMPANY, INC.

POST OFFICE BOX 25, STATION C — **GREENWICH AND MORTON STS.**

NEW YORK CITY

BOSTON
PROVIDENCE
CHICAGO

CIBA COMPANY LIMITED, MONTREAL

PHILADELPHIA
CHARLOTTE
SAN FRANCISCO

Representing Society of Chemical Industry in Basle — **Vat Dyes of the Dow Chemical Company, Incorporated.**

When you run into these jobs★~
★
REMOVING DIFFICULT SPOTS from PIECE GOODS, caused by water repellent preparations or wax emulsions.
★
SCOURING VERY GREASY PIECE GOODS. For example, woolens treated with mineral oil.
~ You'll thank us for this new development!
★
SCOURING RAYONS clean of oxidized mineral oils or saponifiable oils which have palmerized or oxidized.
★
PIECE GOODS RE-DYES .. to remove wax emulsions or water repellents.
★
ALL JIG WORK SCOURING

DEWAXIT

These are not ordinary problems. They're often tough jobs when you face them.

Neither is DEWAXIT an ordinary, routine scouring adjunct. It is specially developed for difficult work.

DEWAXIT is easily emulsifiable in water and alkaline solutions. Used in conjunction with your regular scouring bath, it goes to work on oils, fats, greases, water repellents, wax emulsions—and quickly, thoroughly removes every trace. DEWAXIT is particularly effective in removing rancid or oxidized oils . . . in fact, ALL stains and oils of a greasy nature.

Write for a sample of DEWAXIT. Tell us your problem. Full instructions will be sent.

Onyx Oil & Chemical Co., Jersey City, N. J.

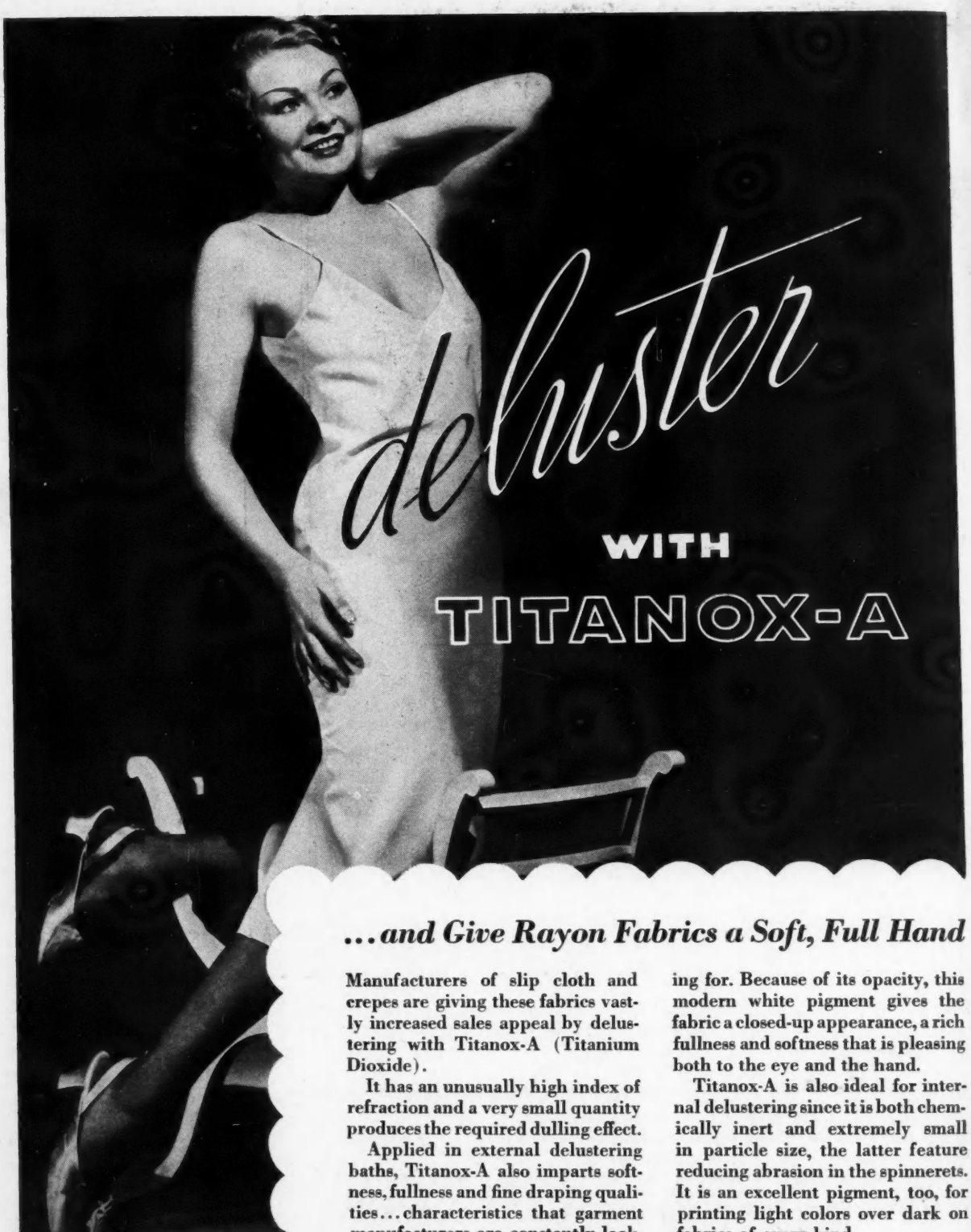
Specialists on Finishing Materials

New England Office: 100 Fountain St., Providence, R I.
Midw. Repr.: Maher Color & Chemical Co., Inc., Chicago
In Canada: Onyx Oil & Chemical Co., Ltd., Montreal

Onyx
LABORATORY-CONTROLLED
PROCESSING & FINISHING COMPOUNDS

ANNOUNCEMENT

IT IS with pleasure that we announce our new address. Here, under one roof, equipped with every modern facility for efficient service, are combined the GDC offices, laboratories, warehouse and shipping rooms. From these new quarters GDC now offers its customers the advantages of a complete line of dyestuffs for wool, cotton, silk, rayon, paper, leather, paints, dry colors, resins and various other trades using colors or allied products, backed by a comprehensive technical service for their application. GENERAL DYESTUFF CORPORATION. 435 Hudson St., N. Y.



...and Give Rayon Fabrics a Soft, Full Hand

Manufacturers of slip cloth and crepes are giving these fabrics vastly increased sales appeal by delustering with Titanox-A (Titanium Dioxide).

It has an unusually high index of refraction and a very small quantity produces the required dulling effect.

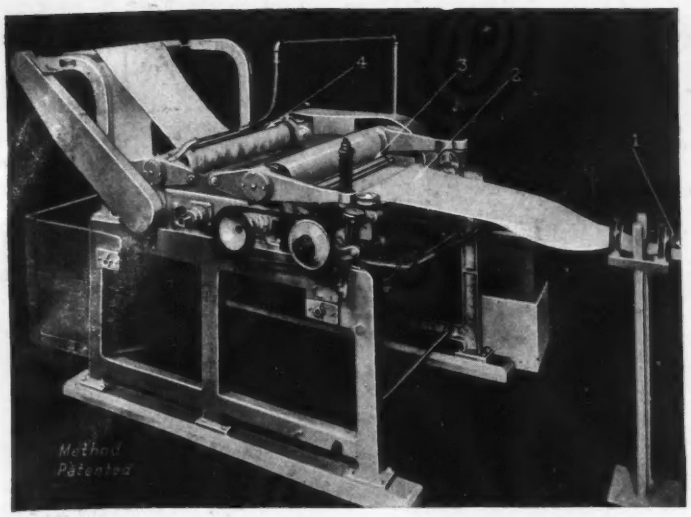
Applied in external delustering baths, Titanox-A also imparts softness, fullness and fine draping qualities... characteristics that garment manufacturers are constantly looking for. Because of its opacity, this modern white pigment gives the fabric a closed-up appearance, a rich fullness and softness that is pleasing both to the eye and the hand.

Titanox-A is also ideal for internal delustering since it is both chemically inert and extremely small in particle size, the latter feature reducing abrasion in the spinnerets. It is an excellent pigment, too, for printing light colors over dark on fabrics of every kind.

TITANIUM PIGMENT CORP.
Selling Agents
TITANOX-A (*Titanium Dioxide*)

111 Broadway, New York, N. Y.; Carondelet Station, St. Louis, Mo.; National Lead Co. (Pacific Coast Branch), 2240 24th St., San Francisco, Calif.; Canadian Distributor: Wilson, Paterson, Gifford (1935), Ltd., 3552 St. Patrick St., Montreal; 132 St. Helen's Ave., Toronto.

TITANOX-A



1—Soaking wet fabric in rope form.
2—Passes over driven propellor spreader.
3—Uniform extracting by squeeze rolls.
4—Receives chemical treatment.

Knit Goods Dyers . . . *Investigate*

TUBE-TEX

(METHOD PATENTED)

Modern Machinery for RAYON · COTTON · WOOL

Wet Spreading . . . Extracting and Processing Machine

NEW FINISHES

SOFTENING
SIZING
FILLING
STIFFENING
NON-CURLING
WATER PROOFING
LUSTERIZING
DELUSTERIZING
WEATHER PROOFING
HYGROSCOPIC SOFTENERS
FIRE PROOFING
AND OTHER FINISHES

EXTRACTING ADVANTAGES

UNIFORM FINISHED WIDTHS DUE TO WET SPREADING AND SQUEEZE ROLL PRESSURE

ELIMINATION OF EXTRACTOR MARKS AND DISTORTIONS

WIDER WIDTHS OBTAINED AND RETAINED

UNIFORM MOISTURE CONTENT THROUGHOUT PIECE

UNIFORM DYE DISTRIBUTION IMPORTANT FOR DEEP SHADES

CLOTH SPREAD FLAT AND READY FOR ANY TYPE DRYING EQUIPMENT

60,000,000 Pounds of knit fabrics will be processed on Tube-Tex Machines in 1936.

All U. S. and Foreign patents on Tube-Tex Machines controlled by Tubular Textile Machinery Corporation, New York City.

Licensed Manufacturers and Agents

H. W. BUTTERWORTH & SONS COMPANY, PHILADELPHIA, PA.

Established 1820 · PLANTS at PHILADELPHIA and BETHAYRES, PA.

New England Office: TURK'S HEAD BUILDING, Providence, R. I.
Southern Office: JOHNSTON BUILDING, Charlotte, N. C.
In Canada: W. J. WESTAWAY CO., Hamilton, Ontario

BUTTERWORTH *finishing* MACHINERY

The supremacy of
PERKINS
CALENDER ROLLS
is the natural result
of the broadest
experience in the
textile industry.
B. F. PERKINS & SON, INC.
ENGINEERS AND MANUFACTURERS
HOLYOKE, MASS.

NATIONAL

A SELECT LINE OF DIRECT COLORS POSSESSING THE GOOD FASTNESS REQUIRED FOR VAT COLOR DISCHARGE WORK.

NATIONAL SOLANTINE YELLOW RL
NATIONAL SOLANTINE PINK 4BL
NATIONAL SOLANTINE RED 8BLN
NATIONAL ERIE FAST BROWN B CONC.
NATIONAL ERIE CATECHINE B
NATIONAL SOLANTINE BLUE 8GL
NATIONAL SOLANTINE BLUE 4GL
NATIONAL SOLANTINE BLUE FF
NATIONAL NIAGARA FAST BLUE RL
NATIONAL SOLANTINE BLUE R
NATIONAL SOLANTINE GREY GL CONC.
NATIONAL ERIE FAST GREY BL
NATIONAL DIRECT FAST BLACK LSW

NATIONAL DYES

NATIONAL ANILINE & CHEMICAL COMPANY, INC.

40 RECTOR STREET — NEW YORK, N. Y.

BOSTON ..... 150 CAUSEWAY ST.
PROVIDENCE ... 15 WESTMINSTER ST.
CHICAGO ..... 357 W. ERIE ST.
PHILADELPHIA 200-204 S. FRONT ST.
SAN FRANCISCO ... 511 HOWARD ST.
CHARLOTTE ... 201-203 W. FIRST ST.
GREENSBORO ..... JEFFERSON STANDARD BLDG.
ATLANTA ..... 140 PEACHTREE ST.
CHATTANOOGA ..... JAMES BLDG.
PORTLAND, ORE. ..... 646 N. THOMPSON ST.
TORONTO .... 137-145 WELLINGTON ST., WEST

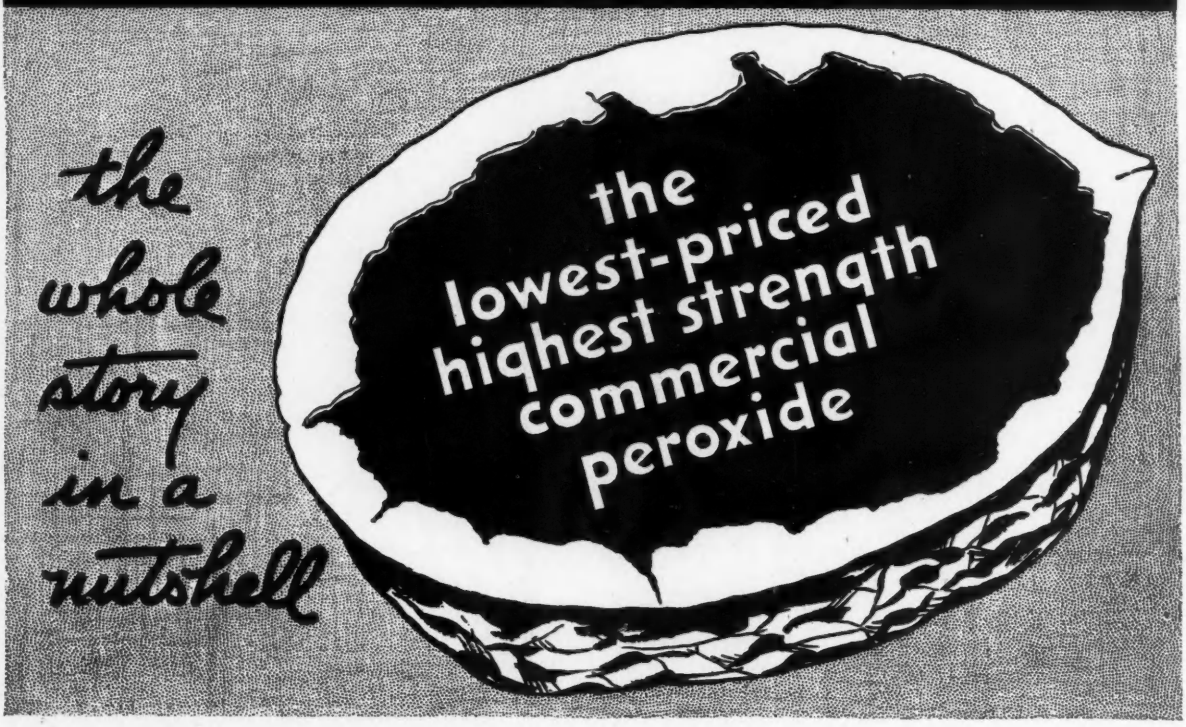
Branches and Distributors throughout the World.

NATIONAL N DYES

SOLOZONE

REG. U.S. PAT. OFF.

DU PONT SODIUM PEROXIDE



By using SOLOZONE* (du Pont Sodium Peroxide) you get the lowest cost for bleaching oxygen. Actually you can save from 25 to 30% on peroxide costs, for SOLOZONE is the *lowest-priced, highest strength* commercial peroxide. You get more bleaching oxygen for less money.

For economical bleaching of all types of cottons, heavy and light goods, knits, yarn-dyed shirtings, sheeting, color piece goods and other goods with vat-dyed stripes or borders where clear ground and bright borders are wanted—use SOLOZONE. You get results with real economies on cottons as well as many other textile fibers.

★ ★ ★

One of our experienced technical men, located right in your district, will be glad to call on you and give you information on SOLOZONE and its application for bleaching.

Just write to our nearest district office.

***SOLOZONE**

is the registered trade-mark for du Pont Sodium Peroxide—a stable water- and acid-soluble powder containing 20% available bleaching oxygen.

DU PONT
REG. U.S. PAT. OFF.

The R. & H. Chemicals Department
E. I. DU PONT DE NEMOURS & COMPANY, INC.
Wilmington, Delaware

District Sales Offices: Baltimore, Boston, Charlotte, Chicago, Cleveland, Kansas City, Newark, New York, Philadelphia, Pittsburgh, San Francisco

CAMEL DYES

Standard Everywhere *since 1876*

ACID ANTHRACENE RED G
ACID ANTHRACENE RED 3B

(Milling Reds)

The CAMEL *line*

AMIDINE (*Direct*)	**CAMACYL** (*For Acetate Silks*)
ACEKO (*Acid*)	**AMALTHION** (*Sulphur*)
AMIDAZO (*Develop*)	**LAVOSAL** (*Fast to Salt Water and Washing*)
KROMEKO (*Chrome*)	**ETHONIC** (*Level Dyeing Acid*)

SOL-AMIDINE
(*Light-fast, Direct*)

● *Neutral Dyeing Colors for* WOOLENS, HOSIERY and SILKS

These two popular colors have very good washing properties. They are particularly adapted for milling. Their excellent fastness requires no chroming, although, they may be afterchromed if desired. Both colors leave vegetable fibres practically unstained.

ACID ANTHRACENE RED G is on the yellow side; ACID ANTHRACENE RED 3B is a pleasing blue shade. Used individually, or in combination, these colors yield outstanding results.

Write for samples and quotations

JOHN CAMPBELL & COMPANY
75 HUDSON STREET NEW YORK CITY

Branches and Warehouses: BOSTON—PHILADELPHIA—PROVIDENCE—CHICAGO—BURLINGTON, N. C.—CONCORD, N. C.
Plant: NEWARK, N. J.

Important Trade Notes

Wide Range of Use Is a Valuable Feature of
Indigosol Golden Yellow IRK

Readily soluble and easily developed, Indigosol Golden Yellow IRK is an important member of the group of very fast Indigosols.

Alone, it produces clear Gold shades. In combination with other fast Indigosols it works in perfect harmony to produce even and level well penetrated shades.

An excellent printing color on cotton and rayon, it is also of great interest to the dyer of cotton, rayon and wool.

Very useful for obtaining Tans and Peach shades.

Brightness and Economy are Strong Characteristics of
Pharmasol Golden Yellow N

Produces clear, bright, fast and economical Golden Yellow shades when printed on cottons or rayons.

When mixed with Pharmasol Scarlet GNN, or Pharmasol Red GNN, a complete range of Tangerine and Gold Shades can be obtained.

Low cost Browns are obtained by mixing with Pharmasol Blue GN Ex. Conc. or Pharmasol Blue GDN.

PHARMASOLS are solutions of stabilized azoic dyes and adjusted to the most practical concentration which can be easily applied with a maximum of efficiency.

PHARMASOLS solve the problem of troublesome dissolving and the uncertainties thereof — and as there is no decomposition there can be no loss of material or value.

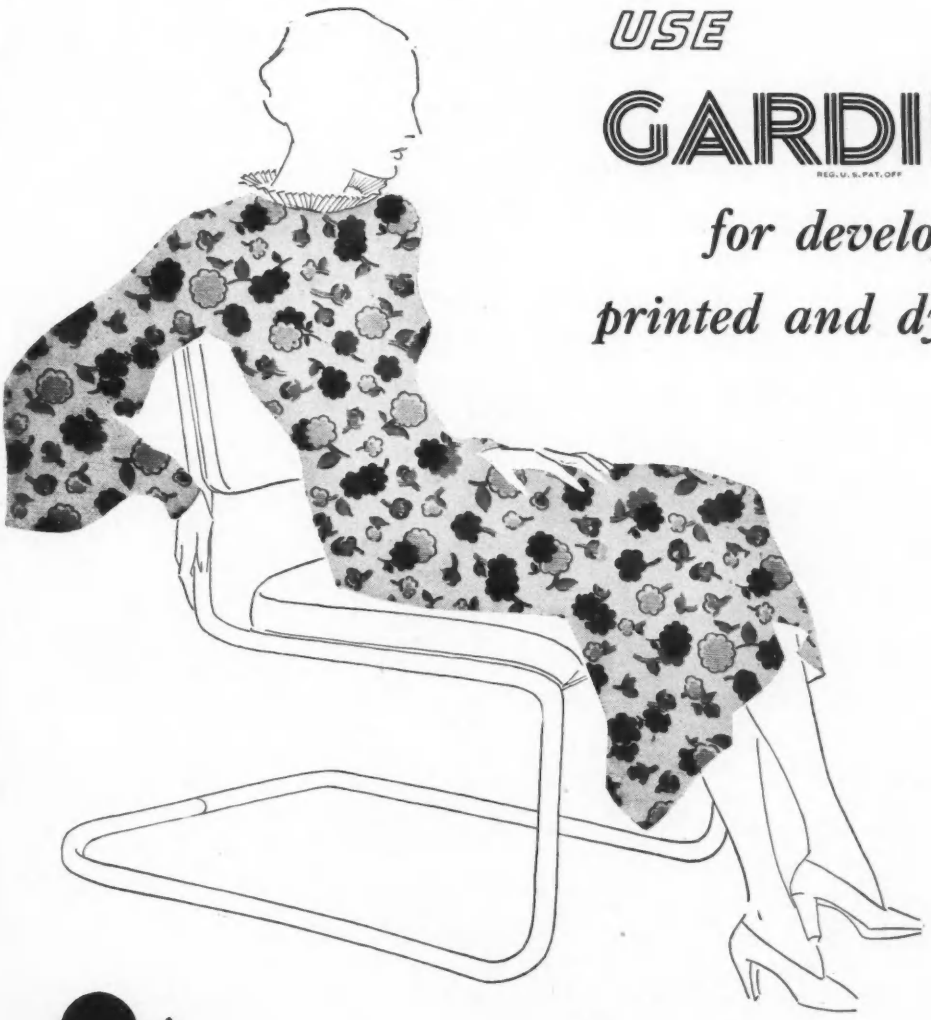
CARBIC COLOR AND CHEMICAL CO., INC.

451-453 Washington Street, New York City

BRANCHES:
PHILADELPHIA CHARLOTTE, N. C.
PROVIDENCE HAMILTON, ONT.
BOSTON

SOLE AGENTS FOR
DURAND & HUGUENIN S. A.
BASLE, SWITZERLAND

EXCLUSIVE DISTRIBUTORS OF
PHARMASOLS
PHARMOLS
PHARMACINES



USE GARDINOL*

REG. U. S. PAT. OFF

for developing printed and dyed cottons

GARDINOL produces a marked increase in the attractiveness of cotton fabrics. It reduces or eliminates the tendency for colors to bleed. It brings out the full shade of color, and clarifies the white areas in prints. By elimination of soap, GARDINOL prevents the usual stains caused by acid or bichromate carrying over with the soap. It saves time and money in the changing of water and the cleaning of boxes.

For full information about the many varied uses of GARDINOL, ask to see a representative of one of the sales agents listed below.

GARDINOL CORPORATION, General Offices, Wilmington, Delaware

SALES AGENTS: Procter & Gamble, Cincinnati, Ohio — National Aniline & Chemical Co., Inc., New York City
E. I. du Pont de Nemours & Co., Inc., Wilmington, Del.

***GARDINOL WA** — ***GARDINOL LS**

*Patented

AVAILABLE IN BOTH FLAKE AND PASTE FORM

*"Gardinol" is the registered trade mark used by the Gardinol Corporation to designate its sulfated higher alcohols

TEXTILE PRODUCTS SCIENTIFICALLY MANUFACTURED AND TECHNICALLY SERVICED BY MEN WHO KNOW THE INDUSTRY

COLD SCOUR PRODUCTS

Over 100 New England manufacturers have recently adopted these products for scouring operations.

LET WAPACO PRODUCTS PROVE THEMSELVES TO YOU.

- Wapaco Includes a Complete Line of Textile Chemicals

WATSON-PARK COMPANY

PROVIDENCE, R. I. TEL: HOPKINS 3022 • TORONTO, CANADA. TEL: MELROSE 3807

Main Office:
261 Franklin Street
Boston, Mass.

New England Agents
for
Bates Chemical Co.
Certified Food Colors

Factory:
Lowell Junction
Mass.

Sole Textile Distributors for
COWLES DETERGENT COMPANY, CLEVELAND, OHIO

• PERMANENT FINISHES •

RHONITE

A clear, colorless, water-soluble resin for the production of resilient and crush-resistant finishes

RÖHM & HAAS COMPANY
222 WEST WASHINGTON SQUARE
PHILADELPHIA, PENNSYLVANIA

BUSINESS IS BETTER

Are you ready with the Best

FOR THE PRINTING SEASON?

WE'RE ready to supply you with textile chemicals for every printing need.

Our HYDROSULFITE A. W. C. is available in varied forms—lumps, pea size, rice size, and powdered—all uniform in size, quality and strength. The purity of our HYDROSULFITE is your assurance of perfect discharges, sharp lines and thorough penetration.

HYDROSULFITE OF SODA CONC. is offered for the reduction of vat dyes and stripping silks.

GUM ARABIC & GUM TRAGACANTH SOLUTIONS are especially clean and smooth—all bark, grit and impurities are removed and the gum treated with the special process used for our SUPERTEX.

Our printing gums meet any and all textile requirements. SUPERTEX has no equal for penetration, absolute purity and complete solubility. VAT GUM W-958 contains the required amounts of hydrosulfite and alkali and is unexcelled as a thickener for vat colors.

HYDROGUM is a combination of printing gums and HYDROSULFITE A.W.C. —absolutely clear, thoroughly strained, and ready for use. It gives cleaner work in any discharge operation.

Write us if you have a special printing problem—the facilities of our laboratories are always at your disposal without cost or obligation.

Our stocks include, in addition to those listed, many staple products for the textile printer. Our chemists will be glad to work with you on any variation of these products to meet your specific requirements.

- ☐ HYDROSULFITE A. W. C.
- ☐ HYDROSULFITE OF SODA CONC.
- ☐ LEUCOTROPE W
- ☐ PRINTING GUMS
  - SUPERTEX NO. 100
  - SUPERTEX S
  - TEXTILE GUM CA-36
  - VAT GUM W-958
- ☐ GUM ARABIC SOLUTION
- ☐ GUM TRAGACANTH SOLUTION
- ☐ HYDROGUM
- ☐ STEAM BLACK S-193
- ☐ PIGMENT WHITES
- ☐ FINISHING OIL W-939A
- ☐ STRIPPING AGENTS
- ☐ PRINTERS' BLANKETS
- ☐ PRINTERS' LAPPINGS

JACQUES WOLF & CO.

MANUFACTURING CHEMISTS AND IMPORTERS . . . PASSAIC, NEW JERSEY

Warehouses: **Providence, R. I.; Philadelphia, Pa.; Utica, N.Y.; Chicago, Ill.; Greenville, S.C.; Chattanooga, Tenn.**

THE ANSWER IS "YES IF YOU USE LAUREL SPLASHPROOF No. 5"

This profitable finish gives your hosiery that extra service women are demanding today. Easy to use, Splashproof No. 5 is efficient, safe. Will not coat the fibers. . . . Why postpone profit? Instruct your finisher to use Splashproof No. 5 today.

LAUREL SOAP MFG. CO., INC.
Wm. H. Bertolet's Sons
Established 1909
2604 E. Tioga Street Philadelphia, Pa.
Warehouses
Paterson, N. J. Chattanooga, Tenn. Charlotte, N. C.

ESTABLISHED 1895

BOSSON & LANE, Inc.

Manufacturers of
The Original
BLEACHING OIL
for boiling out Cotton, to produce a foundation for a Pure White

High Grade Sulphonated and Saponified
CASTOR OIL PRODUCTS

Para Soap Oil

BINDOL
A superior binding agent
for sizing and back filling

B & L Bleachers' Bluings
and Violet Tints

Works and Office, **ATLANTIC, MASS.**

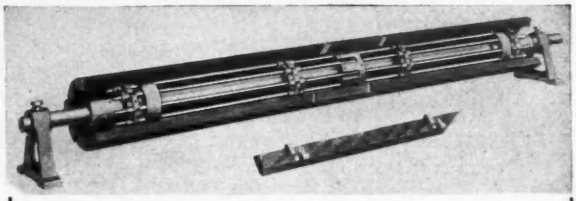
Fleeting seasons bring their new galaxy of color and mode . . . and rapidly the fashion picture changes. But there's one attribute of all merchandise that's *always* in style—and that is *quality*! The appeal of fine finished, long wearing hosiery never changes.

So, whatever the style and color trends, leading mills consistently use "Brosco" Finishes to improve the quality . . . enhance the appearance and prolong the life of the hosiery they make.

Thus, they satisfy the primary demand of the modern market (for hosiery, "Brosco" Finished resists runs and spots, wears longer and preserves its lovely, dull, soft texture throughout its service life) . . . thus, they assure the steady, profitable sales volume that comes from completely satisfied customers.

Write for complete information or have one of our hosiery experts call.

SCHOLLER BROS., INC.
Mfrs. of Textile Soaps, Softeners, Oils, Finishes
Collins & Westmoreland Sts., Philadelphia, Pa.
St. Catharines, Ontario, Canada



***The* V. V. EXPANDER**

Economy, better stretch and longer useful life feature the Van Vlaanderen Expander —an entirely new design that prevents shifting; that eliminates the danger of oil or rust spots on cloth and gives long service without repair.

All moving metal parts are of stainless steel. Bearings require no oil and even after long use, hold slats at proper position to give correct contact on cloth.

MACHINE COMPANY

Write for leaflet.

VAN VLAANDEREN MACHINE CO.
370 STRAIGHT STREET, PATERSON, N. J.
World's largest manufacturers of silk and rayon processing machinery

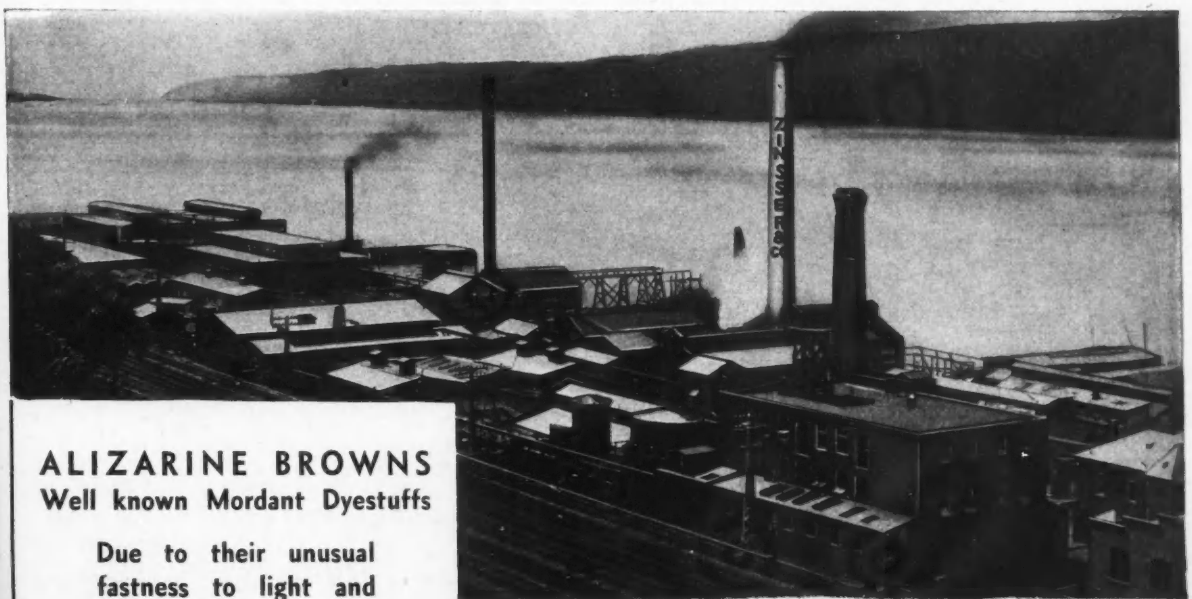
TEXTILE CHEMICAL SPECIALTIES AND ORIGINAL DYESTUFFS FOR HOSIERY

Manufactured under the personal supervision of technically trained executives who possess years of experience in the operation of hosiery dyeing plants.

• BICK & CO., INC. •

Manufacturing Chemists

READING, PA. Philadelphia Office, 776 Drexel Building



ALIZARINE BROWNS

Well known Mordant Dyestuffs

Due to their unusual fastness to light and fulling, they are in wide demand for the production of men's wear fabrics.

Applicable to machine dyeing

ZINSSER & COMPANY, Inc.

ESTABLISHED 1897

Manufacturing Chemists

HASTINGS-ON-HUDSON NEW YORK

FOR **WATER PROOFING**

COTTON • SILK • WOOL
RAYON • ACETATE
and OTHER FIBRES

USE

HYDROXY K7

ONE BATH WATER PROOF

The KALI Mfg. Co.
Manufacturing Chemists
1410 N. Front Street, Phila., Pa.

ALROSE

CHEMICALS

ALROSE
Wetting Agents

ALROSE
Silk and Rayon Printing Gums

ALROSE
Waterproofing Compounds

ALROSE
Delusterants

ALROSE
Fulling Compounds

ALROSE
Mercerizing Assistants

ALROSE
Oils & Softeners

Textile Soap Specialties
—and many other textile specialties.

ALROSE Chemicals are the result of continuous effort on the part of trained research chemists and practical men to produce products that will meet the exacting demands of modern textile processing. Our organization is at your service.

ALROSE CHEMICAL CO.
80 Clifford Street Tel. DExter 2073
PROVIDENCE, RHODE ISLAND

SYNTHETIC CHEMICALS FOR BETTER TEXTILE FINISHING

A full line of

DYESTUFFS AND ANILINE COLORS

Chemicals and Finishing Materials for All Textile Purposes

Inquiries about Technical Problems Invited

FACTORIES:
CHEMICAL MANUFACTURING CO., ASHLAND, MASS.
NEW BRUNSWICK CHEMICAL CO., NEWARK, N. J.

NYANZA COLOR & CHEMICAL COMPANY, INC.

215 Water Street, New York City

—BRANCHES—
549 WEST RANDOLPH ST. CHICAGO, ILL.
115 SOUTHWEST FOURTH AVE., PORTLAND, ORE.
NEW ENGLAND OFFICE, ASHLAND, MASS.
635 DREXEL BUILDING, PHILADELPHIA, PA.
911 NORTH 6th AVE., KNOXVILLE, TENN.
JOHNSTON BLDG., CHARLOTTE, N. C.

White Whites • Sharp Prints

"USCOSOL"

Sodium Formaldehyde Hydrosulphite

A stabilized product of uniform strength and greater solubility. Free from residue and metallic impurities.

Furnished in powder or lumps.

• OTHER PRODUCTS OF THE TEXTILE DIVISION OF U. S. OIL

HYDROSULPHITES	SULPHONATED	
Uscosol { Discharge / Printing Powder and Lumps	Castor	Fat Liquors
Uscopon Extra Stripping Shoddy and Wool	Castopole	Sponging Compounds for Leather
Uscopon (liquid) stripping	Double Sulphonated Tallow	Wool Oils
Hydrite Sodium Hydrosulphite conc.	Cocoanut Oil	Scouring and Fulling Soaps
	Cod Oil	Scouring and Fulling Oils
	Neatsfoot Oil	Kier and Cleaning Compounds
	Olive	Zinc Sulphate
	Silk Soaking and Degumming Oils	Zinc Oxide
	Rayon Oils	

WAREHOUSES

Atlanta, Ga. — Philadelphia, Pa.
Chattanooga, Tenn. — Springfield, Mass.
Columbia, S. C. — Winchester, Va.
Nashville, Tenn. — Worcester, Mass.

U·S

CHEMICAL DIVISION

U. S. OIL COMPANY

PROVIDENCE, RHODE ISLAND

New Jersey Representative—P. H. Doremus & Co., Paterson

COLLECTIVE THINKING

Will Help You Get It.

When you are confronted with new finishing problems and past experience does not give you the answer, remember that "time is money" and that mistakes are costly. Choose the quickest and surest road to a solution, namely COLLECTIVE THINKING.

Collective thinking via A-H Consultation Service has solved thousands of stubborn sizing and finishing problems for textile plants. This is only to be expected inasmuch as A-H Service is backed by a company experience of 121 years and a staff of specially trained chemists, assisted by a completely equipped, modern laboratory.

Chemicals

Sizing and Finishing Gums and Compounds • Soluble Gums • Softeners • Soluble Oils Tallow • Waxes Soaps • Flour • Dextrines • Starches Pigment Colors and Lakes • Ammonia Acids • Blue Vitriol Borax • Bichromate of Soda • Bichromate of Potash Liquid Chlorine Chloride of Lime Caustic Soda (solid or flaked).

A-H Service is free. Why not use it?

Get in touch with our nearest representative.

Arnold, Hoffman & Co., Inc.

Established 1815. *Plant at Dighton, Mass.*

PROVIDENCE, R. I.

NEW YORK BOSTON PHILADELPHIA CHARLOTTE

The Result . . .

—Better Textile Printing!

SOLVAY

TRADE MARK REG. U. S. PAT. OFF.

POTASSIUM CARBONATE LIQUOR

(47% K_2CO_3)

Efficient, economical to the last drop . . . no extra mixing . . . no straining . . . no time wasted . . . a quality product without sludge or sediment. Comes in beautifully clear water-white solution ready for use. Write for prices and further particulars on this product today.

CAUSTIC SODA

SOLID • GROUND • FLAKE • LIQUID

Users of Solvay Caustic Soda have been receiving a standard product . . . a uniform, full strength product . . . since 1881.

Experienced users will testify to its excellent performance in the various textile operations in which it is required. Because Solvay Caustic Soda is manufactured under the highest degree of technical supervision . . . the latest scientific methods, you are assured of the finest textile results.

SEND FOR INFORMATION ON

Soda Ash • Caustic Soda • Ammonium Chloride Liquid Chlorine • Textile Sodas • Sodium Nitrite Calcium Chloride • Causticized Ash • Caustic Potash Ammonium Bicarbonate • Ortho-dichlorobenzene Para-dichlorobenzene • Salt • Potassium Carbonate

SOLVAY SALES CORPORATION

Alkalies and Chemical Products Manufactured by The Solvay Process Company

40 RECTOR STREET NEW YORK

BRANCH SALES OFFICES:

Boston, Charlotte, Chicago, Cincinnati, Cleveland, Detroit, Indianapolis, Kansas City, New Orleans, New York, Philadelphia, Pittsburgh, St. Louis, Syracuse

Index to Advertisers

Alrose Chemical Co.	XX
American Aniline & Extract Co., Inc.	
American Aniline Products, Inc.	Third Cover
American Cyanamid & Chemical Corp.	Second Cover
Arkansas Company	
Arnold-Hoffman & Co.	XXI
Bellevue-Stratford	
Bick & Co., Inc.	XIX
Bosson & Lane, Inc.	XVIII
Buffalo Electro-Chemical Co.	
Butterworth, H. W. & Sons, Co.	VII
Calco Chemical Co.	XIV
Campbell & Co., John	XI
Carbic Color & Chemical Co.	XII
Carbide & Carbon Chemicals Corp.	
Carbondale Machine Co.	
Ciba Company, Inc.	III
Colgate-Palmolive-Peet Co.	
Commonwealth Color & Chemical Co.	
Du Pont de Nemours & Co., E. I.	
Fine Chemicals Division	
R. & H. Chemicals Dept.	X
Franklin Process Co.	
Gardinol Corp.	XV
Geigy Company, Inc.	Front Cover
General Chemical Co.	
General Dyestuff Corp.	V
Hercules Powder Co.	
International Nickel Co.	
Kali Manufacturing Co.	XX
Laurel Soap Mfg. Co.	XVIII
Mathieson Alkali Works	
National Aniline & Chemical Co.	IX
National Oil Products Co.	
Nyanza Color & Chemical Co.	XX
Onyx Oil & Chemical Co.	IV
Perkins & Sons, B. F.	VIII
Philadelphia Quartz Co.	
Procter & Gamble	
Riverbank Court Hotel	
Rohm & Haas Co.	XVI
Royce Chemical Co.	Back Cover
Sandoz Chemical Works	
Scholler Bros., Inc.	XVIII
Solvay Sales Corp.	XXII
Stein, Hall & Co., Inc.	
Thomas, Arthur H. Co.	
Titanium Pigment Co.	VI
Union Carbide & Carbon Corp.	
U. S. Oil Co.	XXI
Van Vlaanderen Machine Co.	XVIII
Virginia Smelting Co.	
Wallerstein Co., Inc.	
Watson Park Co.	XVI
Warwick Chemical Co.	
Wolf & Co., Jacques	XVII
Young Aniline Works	
Zinsser & Co.	XIX
Zurn Co., O. F.	